545

PHYSICS ABSTRACTS

BEING

SCIENCE ABSTRACTS—SECTION A

EDITED AND ISSUED MONTHLY BY
THE INSTITUTION OF ELECTRICAL ENGINEERS
IN ASSOCIATION WITH
THE PHYSICAL SOCIETY
THE AMERICAN PHYSICAL SOCIETY
THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

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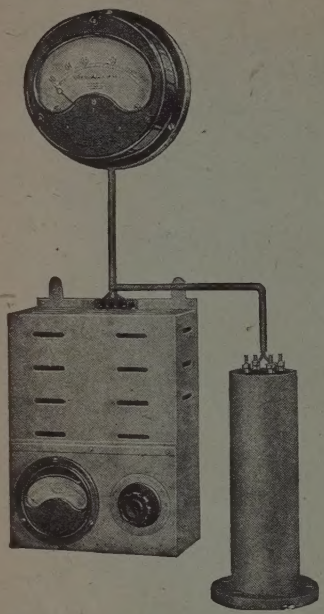
ABSTRACTS 980–1283

Vol. 46 MAY, 1943 No. 545

ELECTRICAL HIGH VACUUM GAUGES



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Erratum: Abstr. 899, line 1: *for* BONDI *read* BIONDI.

VARIOUS SUBJECTS

980 16

Stratified systems of logic. NEWMAN, M. H. A. *Proc. Camb. Phil. Soc.*, 39, *pp.* 69–83, *April*, 1943.

See Abstr. 1132 389.6 : 537.7 : 621.317

MATHEMATICS

See Abstr. 991 512.394 : 517.512 : 518.5

981 512.94 : 519.49

On ideals in the Cayley–Dickson algebra. MAHLER, K. *Proc. Roy. Irish Acad.*, 48*A*, *pp.* 123–133, *Dec.*, 1942.

982 512.942 : 516.3

Motion re moving axes. CAMPBELL, J. W. *Trans. Roy. Soc. Can.*, 36, *pp.* 1–6, *May*, 1942.—Development of general formulae for the derivatives of vectors, when the origin is moving as well as the orientation of the axes changing, is given.

983 513.491 : 513.814 = 4

Geometry of the dividers and of the standard gauge-length. ROSSIER, P. *Arch. Sci. Phys. Nat.*, 24, *March–April* (*Suppl. No.* 1, *C.R. Soc. Phys. Hist. Nat., Genève*, 59, *pp.* 47–48), 1942.—It is shown how dividers, whilst incapable of tracing a circle continuously, can solve all the elementary constructions possible with ruler and compasses. By the intermediate construction of similar figures, this is also possible with fixed dividers giving only a std. gauge-length. A. HU.

See Abstr. 983 513.814 : 513.491 = 4

See Abstr. 982 516.3 : 512.942

984 517.39

Cesàro totalization. JEFFERY, R. L., AND ELLIS, H. W. *Trans. Roy. Soc. Can.*, 36, *pp.* 19–44, *May*, 1942.

See Abstr. 991 517.512 : 512.394 : 518.5

985 517.512.2 : 621.3.018.3 = 3

On the discontinuity method for harmonic analysis. ZECH, T. *Arch. Elektrotechn.*, 36, *pp.* 322–328, *May* 31, 1942.—[Abstr. 938 B (1943)].

986 517.56

Inverse functions of complex quantities. DWIGHT, H. B. *Elect. Engng, N.Y.*, 61, *pp.* 850–853, *Dec.*, 1942.—A set of formulae for $\sin^{-1}(x \pm jy)$, $\sinh^{-1}(x \pm jy)$, etc.

987 517.919

A generalization of the factorization method for solving eigenvalue problems. INFELD, L. *Trans. Roy. Soc. Can.*, 36, *pp.* 7–18, *May*, 1942.—A continuation [see Abstr. 1445 (1941)]. The type of differential equation which can be approached by the factorization is generalized.

988 517.934

A new analytical method for solving van der Pol's and certain related types of non-linear differential equations, homogeneous and non-homogeneous. SHOHAT, J. *J. Appl. Phys.*, 14, *pp.* 40–48, *Jan.*, 1943.—A simple analytical treatment is developed for the equation $d^2u/dt^2 - \varepsilon(1 - u^2) \times (du/dt) + u = 0$. If $\varepsilon \ll 1$, $u(t)$ can be approximated for $t \geqslant 0$, by a simple oscillation with amplitude 2. Further, $u^2(t) + u'^2(t) \sim 4$, $t \geqslant 0$, $0 < \varepsilon \ll 1$. The method and results are extended to the general equation $d^2u/dt^2 - \varepsilon F(u)(du/dt) + u = 0$, for $F(u) = 1 - u^4$, $1 - 2au - u^2$, $a = \text{const.}$; also to the non-homogeneous equation $d^2u/dt^2 - \varepsilon F(u)(du/dt) + u =$ given function of t.

989 517.942.6 : 531.15

The integration of the differential equation of the ultracentrifuge. ARCHIBALD, W. J. *Ann. N.Y. Acad. Sci.*, 43, 5, *pp.* 211–227, 1942.—The paper shows how to calculate the conc. of a dilute solution as a function of position in a gravitational field of force for all values of the time. This information is now obtained by solving the equation, $(1/r)\partial/\partial r\{(D\partial c/\partial r - \omega^2 rsc)r\} = \partial c/\partial t$, where r is the dist. from the centre of rotation to any point of the solution of conc. c, ω the ang. vel. of rotation, D the coeff. of diffusion and s the sedimentation vel. of the dissolved substance. H. H. HO.

990 518.3

An extension of nomography. HANSEL, C. W. *Phil. Mag.*, 34, *pp.* 1–26, *Jan.*, 1943.—Examples are given indicating the scope of nomographic methods in general mathematics. Nomographic methods are extended to the representation and evaluation of imaginary quantities, to the numerical solution of differential equations, to the reduction of observations and the determination of laws. The author considers that early attention should be given to nomographic methods in any course of mathematical and scientific training. Such methods would be greatly facilitated if accurate nomographic paper were made available. A. W.

991 518.5 : 512.394 : 517.512

The use of a mechanical synthesizer to solve trigonometric and certain types of transcendental equations, and for the double summations involved in Patterson contours. BROWN, S. L., AND WHEELER, L. L. *J. Appl. Phys.*, 14, *pp.* 30–36, *Jan.*, 1943.—A method is shown whereby equations in trigonometric form and types of transcendental equations, which can be expanded into rapidly converging series, may be solved by a mechanical and graphical process. A method is also shown which effects the double summation of Fourier series used in the Patterson method for the determination of interatomic distances in crystals. Graphs are given to illustrate the processes.

992 519.25 : 541.088

Simplifications in the statistical analysis of physical-chemical data. EGLOFF, G., AND KUDER, R. C. *J. Phys. Chem.*, 46, *pp.* 926–933, *Nov.*, 1942.—The calculation of the standard errors of empirically determined polynomial equations and their parameters can be simplified in certain cases by the use of tabulated constants which obviate long summations involved in the method of least squares.

993 519.251 : 539.16.08

On the statistics of random distributions of paired events, with applications to the results obtained in the use of the interval selector with particle counters. FEATHER, N. *Proc. Camb. Phil. Soc.*, 39, *pp.* 84–99, *April*, 1943.

994 519.272.119

On bivariate correlation surfaces. RAO, C. R. *Sci. and Cult.*, 8, *pp.* 236–237, *Nov.*, 1942.

See Abstr. 981 519.49 : 512.94

ASTRONOMY. GEODESY

995 523.11 = 4

Origin, structure and evolution of the planets. DAUVILLIER, M. A. *Arch. Sci. Phys. Nat.*, 24, *pp.* 5–24, *Jan.–Feb., and pp.* 65–95, *March–April*, 1942.—The author extends the tidal theory of the origin of the planets by taking into account the electromagnetic effects accompanying the emission of tidal filaments of ionized matter. These effects are shown to stabilize the filaments, which would otherwise diffuse away, for long enough for the matter to condense into planetary twins distributed at distances from the Sun which increase exponentially, as observed. The twin planets usually merge whilst still gaseous, but the Earth-Moon system is an exception. In an ephemeral pseudo-stellar state the larger planets throw off satellites by a mechanism similar to the main one. Certain terrestrial effects produced by the Sun are adduced as evidence for the contemporary existence of the electronic spirals of the new theory. The structure of the planets is broadly sketched by tracing the chemical reactions taking place before cooling and the photochemical processes occurring afterwards. A. HU.

996 523.34

Does anything ever happen on the Moon? HAAS, W. H. *J. Roy. Astr. Soc. Can.*, 36, *pp.* 237–272, *July–Aug.*; 317–328, *Sept.*; 361–376, *Oct., and pp.* 397–408, *Nov.*, 1942.—Results of 7 000 lunar observations made by a group of selenographers in America between 1935 and 1941 are presented and compared with previous work. Changes of intensity and colour are discussed in detail and distinguished from the effects of changing illumination. The question of a lunar atmosphere is discussed and special attention is given to possible observations of lunar meteors. It is concluded that small real changes have been observed on the Moon's surface, and possible explanations are reviewed. A. HU.

997 523.45

Hornsby's observations of Jupiter, 1774–1784. BAWTREE, B. F. *Mon. Not. Roy. Astr. Soc.*, 102, 6, *pp.* 276–277, 1942.

998 523.74 : 550.386 : 551.510.535 = 3

Simultaneous disturbances on the sun, in the earth's magnetism and in the ionosphere. WALDMEIER, M. *Naturwissenschaften*, 30, *p.* 260, *April* 24, 1942.

H. G. S.

999 523.742

Convective equilibrium and solar limb darkening—a correction. THACKERAY, A. D. *Mon. Not. Roy. Astr. Soc.*, 102, 6, *pp.* 272–274, 1942.—[Abst. 3101 (1940)].

1000 523.746

Provisional sunspot-numbers for July to September, 1942. BRUNNER, W. *Terr. Magn. Atmos. Elect.*, 47, *p.* 300, *Dec.*, 1942.

See Abstr. 1258 523.746 : 550.384

1001 523.78

Partial solar eclipse 1942 September 10. *Mon. Not. Roy. Astr. Soc.*, 102, 6, *p.* 275, 1942.

1002 523.813 : 523.832

Orbital motion and measurements for parallax. JACKSON, J. *Mon. Not. Roy. Astr. Soc.*, 102, 6, *pp.* 257–260, 1942.—The residuals of parallax measurement tend to show spurious periods of about 2 years. While orbital motion with a period of 1 year may make parallax determinations unreliable, the parallax will not be seriously affected if the period is longer than 1½ years.

1003 523.82

Obscuration around the North Pole. MARTIN, E. G. *Mon. Not. Roy. Astr. Soc.*, 102, 6, *pp.* 261–267, 1942.—[See Abstr. 25 (1943)]. An account is given of previous work on the region within 10° of the North Pole of the sky, and the Greenwich counts in the region within 3° of the Pole are used in an attempt to locate absorption. Colour excesses from several sources together with spectroscopic distances are used to detect reddening. A discussion of the mean value of the colour index of unobscured A0 stars follows with a critical examination of the frequently quoted figure of $-0^m.14$. It is suggested that the total reddening is smaller than previously accepted and the distance at which it occurs is greater.

See Abstr. 1002 523.832 : 523.813

1004 523.841.1 : 523.872 = 4

Comparison of emission lines in Nova Herculis 1934 and Nova Lacertae 1936. ROSSIER, P. *Arch. Sci. Phys. Nat.*, 24, *March–April* (*Suppl. No.* 1, *C.R. Soc. Phys. Hist. Nat., Genève*, 59, *pp.* 38–39), 1942.—Relative intensities are given for 5 lines in the visible region of the spectra of these novae. In spite of the fact that the observations relate to different evolutionary stages, N. Her being observed after a secondary max. which did not appear in N. Lac, the rel. intensities are in good agreement. A. HU.

1005 523.841.11 : 523.877

On the material ejected from novae. PAYNE-GAPOSCHKIN, C., AND GAPOSCHKIN, S. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 482–490, *Nov.*, 1942.—Intensities of the bright lines in the spectra of 5 novae are measured with the object of estimating the quantity and composition of the ejected gaseous matter. The excitation temperatures are very high as in the nuclei of planetary nebulae, but the electron temperatures are $< 10\,000°$K., as in their envelopes. Electron densities fall from 10^8 or 10^9 per cm.^{3} at the outburst to 10^5 or 10^6 per cm.^{3} when the nova is 7 magnitudes fainter: thus the ejected envelopes are intermediate betw. those of planetary nebulae and those of Wolf–Rayet stars. The mass ejected is from 10^{27} to 10^{30} gm., in rough proportion to the luminosities at max. A. H.

1006 523.841.2.035

Dimensions and constitution of variable stars. PAYNE-GAPOSCHKIN, C., AND GAPOSCHKIN, S. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 490–495, *Nov.*, 1942.—The luminosities and radii of the intrinsically variable stars (Cepheids, long-period variables and semi-regular variables) are related graphically to their periods and spectral types. Estimates of the internal conditions suggest that the point-source model is appropriate, and central temperatures are calculated on this model and plotted against period and spectrum. The sub-atomic processes likely to be i-

olved in the maintenance of radiation in the various inds of variables are distinguished, and it is pointed ut that 2 members of a single system may be drawing n different energy sources. A. HU.

1007 523.841.36

Study of the RV Tauri variables. PAYNE-GAPOCHKIN, C., AND BRENTON, V. K. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 496–500, *Nov.*, 1942.—From 6 000 observations of 14 bright RV Tauri stars the authors summarize the characteristics of the class. The peculiar lapses of UU Herculis into Cepheid-like variation are discussed, and the rel. betw. RV Tauri stars and other variables is shown on a comprehensive period/spectrum diagram. The period/luminosity relation for these stars is so scattered as to be non-existent. A. HU.

See Abstr. 1013, 1014 523.842 : 530.12 = 4

1008 523.854.22

Galactic and extragalactic studies. XVI. Photographic amplitudes of classical Cepheids. SHAPLEY, H. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 501–507, *Nov.*, 1942.—Amplitudes of variation of photographic magnitudes of 562 Cepheids in the Small Magellanic Cloud are correlated with period and abs. magnitude, small amplitudes being associated with short periods and with low luminosities. Exhaustive study of special regions of the Cloud gives similar results and shows that the data are free from selection effects. Reasons are advanced to account for the systematic deviation found betw. the mean amplitudes in the Cloud and those in the galaxy. A. HU.

See Abstr. 1004 523.872 : 528.841.1 = 4

1009 523.877

Colour temperatures of convective stars. TAI, W. S., AND THACKERAY, A. D. *Mon. Not. Roy. Astr. Soc.*, 102, 6, *pp.* 268–271, 1942.—The wavelength distribution of emergent radiation at the centre of the disc from atmospheres in full radiative and convective equilibrium is compared. For temp. $> 6\,000°$ the influence of convection upon colour temperature is too small to contribute appreciably to the observed spread in colour temperature of early-type stars. Among stars of late type convection can produce an appreciable reddening.

See Abstr. 1005 523.877 : 523.841.11

1010 525.2 = 4

Liquefaction of the Earth. MERCIER, A. *Arch. Sci. Phys. Nat.*, 24, *March–April* (*Suppl. No.* 1, *C.R. Soc. Phys. Hist. Nat., Genève*, 59, *pp.* 82–86), 1942.—Previous calculations of the rate of cooling of a gaseous Earth by radiation have assumed an effective temperature of 6 000°K. The author applies Eddington's formula for the central temperature of a star and deduces an upper limit of 200 000°K. for the central temperature, which gives an effective temperature of 1°K. Rapid liquefaction (in 10 000 yr.) will take place best in a polytropic Earth of effective temperature 550°K. A. HU.

See Abstr. 1278 525.75 : 628.9 : 551.593

PHYSICS: GENERAL

See Abstr. 1227 53 : 541.18

1011 53,08

Modern philosophy of science and some problems of classical physics. BROWN, G. B. *Phil. Mag.*, 34, *pp.* 26–32, *Jan.*, 1943.—Certain problems of classical physics, such as the rel. betw. B and H, are discussed from the point of view of the theory previously advanced by the author, which leads to dimensional formulae of the simplest type. The new theory of dimensions leads to the general result that, if numbers are introduced according to the measure-convention of mechanics in two different ways, the ratio of the measurements of the same physical quantity in the two systems must be a power of c, the vel. of light. A. W.

1012 530.1

Physical explanation and the domain of physical experience. LINDSAY, R. B. *J. Wash. Acad. Sci.*, 32, *pp.* 356–359, *Dec.* 15, 1942. A. W.

1013 530.12 : 523.842 = 4

On the conclusion that may be drawn from the problem of double stars concerning the relativity theories. TIERCY, G. *Arch. Sci. Phys. Nat.*, 24, *pp.* 25–36, *Jan.–Feb.*, 1942.—Observations of double stars cannot decide betw. Einstein relativity, employing a const. vel. of light indep. of the motion of the source, and a relativity theory which postulates a non-isotropic propagation of light in the form of ellipsoidal waves in free space. Since the latter retains classical space and a universal astronomical time, the author suggests that it is preferable to the Einstein theory. A. HU.

1014 530.12 : 523.842 = 4

Significance of the problem of double stars in relativity theories. TIERCY, G. *Arch. Sci. Phys. Nat.*, 24, *March–April* (*Suppl. No.* 1, *C.R. Soc. Phys. Hist. Nat., Genève*, 59, *pp.* 45–47), 1942.—With a relativity theory which postulates non-isotropic propagation of radiation there is a critical distance from a double star at which an observer should see the companion star in conjunction with the main star with low-velocity light and simultaneously at quadrature with high-velocity light. The critical distance is however so large that spectroscopic binaries cannot be resolved, and no Doppler effect is to be expected. A. HU.

See Abstr. 1148 530.12 : 539.152.1

See Abstr. 1182 530.145 : 539.31

1015 530.145.63 : 537.122

The energy loss by radiation of fast electrons in a Coulomb field. JAEGER, J. C. *Proc. Camb. Phil. Soc.*, 39, *pp.* 127–130, *April*, 1943.—An exact solution of the problem is given using the relativistic Coulomb wave functions, but depending on a final stage of numerical computation. The method is an extension of that used [Abstr. 3411 (1934)] to determine cross-sections for pair production.

See Abstr. 989 531.15 : 517.942.6

See Abstr. 1155 531.15 : 539.16.08

1016 531.224.4

Buckling of rectangular plates with built-in edges. LEVY, S. *J. Appl. Mech.*, 9, *A171–A174*, *Dec.*, 1942.—An exact solution in terms of infinite series of the problem of buckling by compressive forces in one direction of a rectangular plate with built-in edges (zero slope, zero displacement in the direction normal to the plane of the plate). The buckling load is calculated for 14 ratios of length to width, ranging in steps of 0·25 from 0·75 to 4,

1017 531.224.4

Long continuous columns. SWITZER, F. G. *J. Appl. Mech.*, 9, *A189–A190*, *Dec.*, 1942.—Discusses the strengths of long columns with intermediate guides. The guides were short, with clearance to the (moving) column and were assumed to offer no restraint to angularity.

See Abstr. 1189 531.224.4 : 539.4.014

1018 531.3/.4

The physics of automobile driving. FOUNTAIN, C. R. *Amer. J. Phys.*, 10, *pp.* 322–327, *Dec.*, 1942.—Friction between road and tyre is simulated by means of miniature tyres sliding on glass plates. Under different conditions the coeff. of friction varies from less than 0·1 to 1·2. The average time to set the brakes is $\frac{3}{4}$ sec., and with a coeff. of 0·8 a car going 60 m.p.h. will move 66 ft. before the driver can set his brakes, and 150 ft. farther before the car stops. The greatest safe speed on a curve depends on the coeff. and the radius of the curve. With radius 48 ft. the inner rear tyre cuts in about 1 ft. closer to the curb than the inner front tyre. The total frictional force is very little affected by the gyroscopic action of the wheels; that of the engine flywheel has also little effect. Some of the more common applications of physics are used to indicate correct driving procedure.

G. E. A.

1019 531.391

Theory of vehicle suspensions. MERCIER, P. E. *J. Appl. Phys.*, 14, *pp.* 51–52, *Jan.*, 1943.—Errata. [See Abstr. 2813 (1942)].

1020 531.732 : 621.317.39

On solidified water films. LÖWY, H. *Phil. Mag.*, 34, *pp.* 67–70, *Jan.*, 1943.—[Abstr. 1017 B (1943)].

1021 531.75 + 536.421.1] : 546.23

The density of selenium. CAMPBELL, A. N., AND EPSTEIN, S. *J. Amer. Chem. Soc.*, 64, *pp.* 2679–2680, *Nov.*, 1942.—The densities of selenium (metallic and liquid) were measured over the range 20°–277°. These measurements give no indication of a shifting internal equilibrium. The rise of the m.p. with pressure is calculated.

1022 532.13

The viscosity of dilute solutions of long-chain molecules. IV. Dependence on concentration. HUGGINS, M. L. *J. Amer. Chem. Soc.*, 64, *pp.* 2716–2718, *Nov.*, 1942.—A modification of previous theoretical treatment [Abstr. 1962 (1939)] leads to the equation $(\eta_{sp}/c) = (\eta_{sp}/c)_{c=0}(1 + k'\eta_{sp})$ for the initial conc. dependence of the viscosity. k' is characteristic of a given solute-solvent system; it is the same for solutions, in a given solvent, of different members of a polymer-homologous series.

See Abstr. 1036 532.13 : 541.68 : 532.77

1023 532.133

Viscosity of pure liquids. I. Non-polymerized fluids. II. Polymerized ionic melts. BARRER, R. M. *Trans. Faraday Soc.*, 39, *pp.* 48–67, *Feb.–March*, 1943.—The Arrhenius equation $(\eta = \eta_0 e^{-E_A/RT})$ has been used in a study of the viscosity of pure liquids. Variations of E_A with the nature of the liquid and of E_A and $-\log \eta_0$ with chain length in some homologous series are discussed. Consistent functional relations are found between $-\log \eta_0$ and E_A and when $-\log \eta_0$ is plotted against E_A/T. These relations are indep. of the nature of the liquid for liquid permanent gases, a-polar liquids, polar liquids, hydrogen- and hydroxyl-bonded liquids, non-polymerized ionic melts and liquid metals. E_A for polymerized ionic melts may be very large and frequently depends on temperature. The relation between $-\log \eta_0$ and E_A/T has a different slope and intercept from that for molecular and non-polymerized fluids. In many flow systems it was possible to estimate the number of deg. of freedom involved in each zone, and the total energy per activated deg. of freedom necessary for flow to occur, as well as the zone volume. This calculation was carried out for typical glasses, liquid metals, simple ionic melts, a-polar and polar or hydroxyl-bonded fluids.

1024 532.217.3 : 621.317.39

Electronic liquid-level indicator. CORONITI, S. C. *Rev. Sci. Instrum.*, 13, *pp.* 484–488, *Nov.*, 1942.—[Abstr. 1018 B (1943)].

See Abstr. 1088 532.5 : 536.24.01

1025 532.511 = 3

A new hydrodynamic conservation theorem. ERTEL, H. *Naturwissenschaften*, 30, *pp.* 543–544, *Sept.* 4, 1942.

H. G. S.

1026 532.61.08

The relative surface tension of potassium chloride solutions by a differential bubble-pressure method. LONG, F. A., AND NUTTING, G. C. *J. Amer. Chem. Soc.*, 64, *pp.* 2476–2482, *Oct.*, 1942.—A differential max. bubble-pressure apparatus is described. The rel. surface-tension values for dilute aq. sucrose solutions are similar to those obtained by the capillary height method. The rel. surface tension of KCl solutions is different from that obtained by previous workers. No min. in the surface-tension/conc. curve is observed and the results agree with the Onsager-Samaras predictions. Explanations for the lack of agreement of the results are considered; the most likely is the effect of the zeta potential (Langmuir).

1027 532.612 : 532.614.2

Surface tensions, densities and parachors of the aliphatic nitroparaffins. BOYD, G. E., AND COPELAND, L. E. *J. Amer. Chem. Soc.*, 64, *pp.* 2540–2543, *Nov.* 1942.—The surface tensions of the aliphatic nitro-paraffins at 25·0° vary from 35·78 for nitro-methane to 29·20 dyne cm.$^{-1}$ for 1-nitrobutane. The secondary isomers show characteristically lower free surface energies, with 2-nitrobutane giving 28·65 ergs cm.$^{-2}$. The total surface energies of the nitro-paraffins at 25·0° vary from 77·11 ergs cm.$^{-2}$ for nitromethane to 58·39 ergs cm.$^{-2}$ for 1-nitrobutane. The secondary isomers exhibit a higher surface energy. Critical temperatures are calculated from the Ramsey–Shields equations.

1028 532.613.2 : 541.183.25

Adsorption at solid/liquid interfaces. BARTELL, F. E., AND BENNER, F. C. *J. Phys. Chem.*, 46, *pp.* 847–859, *Nov.*, 1942.—Adsorption values calculated from adhesion-tension and interfacial-tension data of isoamyl alcohol and cyclohexanol show that, for a given alcohol, adsorption is nearly the same at the silica/iso-octane and the water/iso-octane interfaces. The interfacial contact angles formed by water and organic liquid solutions on silica vary as the composition of the organic solution is varied.

1029 532.613.2 : 621.89 : 621.822

The rôle of surface chemistry and profile in boundary brication. BURWELL, J. T. *J. Soc. Automot. ngrs, Phila.*, 50, *pp.* 450–457, *Oct.*, 1942.—[Abstr. 26 B (1943)].

1030 532.613.4

The attachment and detachment of dropping mercury nder various conditions. KOLTHOFF, I. M., AND AHAN, G. J. *J. Amer. Chem. Soc.*, 64, *pp.* 2553–57, *Nov.*, 1942.—When electrically disconnected Hg rops into air-saturated water or when Hg connected with a pool of Hg drops into air-free water an onormally large drop time is found. The abnormal ehaviour becomes more pronounced the smaller the ore of the capillary. The behaviour is interpreted n the basis of interaction betw. the electric double yers at the glass and at the Hg/aq. interfaces.

See Abstr. 1027 532.614.2 : 532.612

1031 532.614.2 : 536.654 = 3

Surface energy and heat of sublimation of solids. RICKE, R. *Naturwissenschaften*, 30, *pp.* 544–545, ept. 4, 1942. H. G. S.

See Abstr. 1101 532.62 : 537.226.1 : 536.423.15

1032 532.685

Darcy's law and upward movement of water in soil. KOTHARI, D. S., AND AULUCK, F. C. *Curr. Sci.*, 11, 430, *Nov.*, 1942.—[See Abstr. 80 (1943)].

See Abstr. 1108 532.696 : 541.183.55 : 536.658

See Abstr. 1037 532.712 : 536.423.15 : 532.77

1033 532.739.2

The solubility relations of mercuric oxide in aqueous olutions of hydrogen chloride. GARRETT, A. B., AND LEMLEY, J. *J. Amer. Chem. Soc.*, 64, *pp.* 2380–2383, *Oct.*, 1942.—A break occurs in the solubility relationships due to the formation of a new solid phase ($2HgO . HgCl_2$). The rel. distribution of Hg among several different ion species is indicated.

1034 532.739.2 : 537.226.2

Solubility of potassium iodate and zinc iodate in dioxane–water mixtures: effect of sorting of solvent molecules. RICCI, J. E., AND NESSE, G. J. *J. Amer. Chem. Soc.*, 64, *pp.* 2305–2311, *Oct.*, 1942.—The solubilities of KIO_3 and $Zn(IO_3)_2$ have been determined at 25° in mixtures of water and dioxane, up to 100% dioxane. The results are used to test the constancy of the activity coeff. of electrolytes at saturation. The agreement betw. observed and calculated solubilities is satisfactory. The results are used to test the applicability of the Born equation when modified for the segregation of solvent molecules by ions in mixed solvents. When this distribution of dielectric is calculated according to the original Debye treatment, the solubilities now predicted for mixtures of low dielectric const. are higher than the observed. [See Abstr. 998 (1940)].

1035 532.739.2 : 541.123.31

The system sodium-nitrate–dioxane–water at 25°. SELIKSON, B., AND RICCI, J. E. *J. Amer. Chem. Soc.*, 64, *pp.* 2474–2476, *Oct.*, 1942.—The solubility relationships in the ternary system $NaNO_3$–dioxane–H_2O at 25° are investigated, using a direct analytical determination of water in the equilibrium liquids. A small region of immiscible liquids appears, for solutions containing betw. 52·13 and 93·40% dioxane and betw. 17·84 and 0·44% $NaNO_3$.

1036 532.77 : 532.13 : 541.68

Viscosities of polyester solutions. FLORY, P. J. *J. Phys. Chem.*, 46, *pp.* 870–877, *Nov.*, 1942.—Viscosities of solutions of decamethylene adipate polyesters in diethyl succinate have been measured at 79°C. The entire conc. range has been covered. Limited results on solutions of several polyesters of lower mol. wt. are reported. The previously discovered relationship [Abstr. 2353 (1940)] betw. the viscosity of the molten polymer and its wt. average chain length applies to solutions containing more than 10% of polymer, provided the wt. average chain length of the system as a whole is used. Wide departure from this relationship in dilute solutions indicates that some other mechanism prevails. In dilute solutions the polymer molecules probably move as units.

1037 532.77 : 536.423.15 : 532.712

The vapour-pressure equations of solutions and the osmotic pressure of rubber. MILLER, A. R. *Proc. Camb. Phil. Soc.*, 39, *pp.* 54–67, *Jan.*, 1943.—Assuming that the solute and solvent molecules in a solution can be regarded as occupying sites on a regular lattice and that the potential energy arises from interactions betw. molecules occupying closest-neighbour sites, the v.p. equations are determined for solutions in which each solute molecule contains 3 submolecules and occupies 3 lattice sites so that successive submolecules occupy closest-neighbour sites on the lattice while each solvent molecule occupies only 1 site. The equations are compared with those of Fowler and Guggenheim for 2 submolecules, and hence are obtained the v.p. equations when each solute molecule contains n submolecules and occupies n lattice sites. These equations are used to determine the osmotic pressure of solutions of long-chain polymers, and an equation for o.p. is found. An equation is found for the entropy of mixing of N_α polymer molecules, each of which contains n submolecules, and of N_β solvent molecules. N. M. B.

1038 533.16

Viscosities of carbon monoxide, helium, neon and argon between 80° and 300°K. Coefficients of viscosity. JOHNSTON, H. L., AND GRILLY, E. R. *J. Phys. Chem.*, 46, *pp.* 948–963, *Nov.*, 1942.—[See Abstr. 347 (1941)]. The viscosities of Co, He, Ne and A, were measured from 80° to 300°K. The measurements were rel. to air at 296·1°K. ($1\,833·0 \times 10^{-7}$ poises). The data are employed to test the reliability of equations which express the temp. dep. of gaseous viscosities.

SOUND. VIBRATIONS

1039 534.6 : 621.317.76

Frequency-response recorder. *Rev. Sci. Instrum.*, 13, *pp.* 464–465, *Oct.*, 1942.—[Abstr. 1034 B (1943)].

1040 534.64 : 621

Portable stroboscopic balancing equipment. *BTH Activ.* [*Brit. Thomson-Houston*], 18, *pp.* 15–17, *Jan.*, 1943.—A tuned reed vibrometer is mounted at one end of the machine and the reed is tuned to give max. vibration at a speed corresp. to that of the rotating shaft. A mark on the shaft is viewed in the flashes of light occurring when the reed just makes contact to complete a stroboscopic tube circuit and when the

tube is glowing steadily. The difference betw. the 2 positions represents ½ the amplitude of vibration. This procedure is repeated with an arbitrary weight in any position. From these 2 results, the correct balance weight and its position are deduced with the aid of a special chart. M.-V.

1041 534.839 : 621.317.39 : 621.396.822

An evaluation of radio-noise-meter performance in terms of listening experience. BURRILL, C. M. *Proc. Inst. Radio Engrs, N.Y.*, 30, *pp.* 473–478, *Oct.*, 1942.—[Abstr. 1113 B (1943)].

OPTICS

1042 535.13 : 537.533.9

Dynamics and scattering power of Born's electron. SCHRÖDINGER, E. *Proc. Roy. Irish Acad.*, 48*A*, *pp.* 91–122, *Nov.*, 1942.—A theoretical paper. The theory formerly developed [Abstr. 94 (1943)] is carried further to the consideration of scattering by an immovable singularity, and by a yielding electron, and the determination of phase shifts. A. J. M.

1043 535.215 : 621.315.59 : 669.75

Photo-electric alloys of alkali metals. SOMMER, A. *Proc. Phys. Soc., Lond.*, 55, *pp.* 145–154, *March*, 1943.—The properties of the Cs-Sb alloy have been investigated. This alloy has the stoichiometric formula $SbCs_3$, has the electric resistance of a semiconductor and emits under favourable conditions about 1 photo-electron for 5 incident light-quanta at 4 600 Å. Alloys of similar structure were also investigated, and the effect of superficial oxidation was studied.

1044 535.243

Objective measurements of spectral intensities. TAWDE, N. R., AND UNVALA, H. *Sci. and Cult.*, 8, *pp.* 238–239, *Nov.*, 1942.

See Abstr. 1280 535.247 : 551.594.52 : 551.593.55

See Abstr. 1279 535.247.2 : 551.593.55

1045 535.247.4

Significance of stray light in photo-electric filter photometers. STATES, M. N., AND ANDERSON, J. C. *J. Opt. Soc. Amer.*, 32, *pp.* 659–666, *Nov.*, 1942.—Points out the errors which may be introduced into a determination of concentration of a solution by means of a filter photometer in which use is made of a wide band of wavelengths. It is not satisfactory to take as the calibration curve of the instrument the straight line (on a semi-log plot) through one observed point and the origin. The instrument should be calibrated for a number of concentrations. The settings should not be obtained by varying the voltage on the lamp as this varies the energy distribution as well as the intensity of the light. J. W. T. W.

1046 535.247.4 : 535.65

A photo-electric tricolorimeter. KNIPE, G. F. G., AND REID, J. B. *Proc. Phys. Soc., Lond.*, 55, *pp.* 81–91, *March*, 1943.—The colorimeter described was designed to measure the colour of nearly-white papers. It makes use of a double monochromator system and 3 diaphragms which select the correct proportion of light of each wavelength to enable the result to be given in C.I.E. units.

1047 535.247.4 : 621.317.39

Light meter. DOWS, C. L. *Gen. Elect. Rev.*, 45, *pp.* 505–509, *Sept.*, 1942.—[Abstr. 1019 B (1943)].

1048 535.3 : 621.396.11 = 3

On the propagation of light in hollow conductors. MATHIEU, A. *Schweiz. Arch. angew. Wiss. Techn.*, 8, *pp.* 288–291, *Sept.*, 1942.—[Abstr. 1103 B (1943)].

1049 535.317.2

The Airy disc formula for systems of high relative aperture. HOPKINS, H. H. *Proc. Phys. Soc., Lond.*, 55, *pp.* 116–128, *March*, 1943.—The light distribution near the focus of high-aperture systems is investigated, account being taken of 2 factors, neglected for low-aperture systems: (*a*) an inhomogeneity of amplitude over the emergent spherical wave surface, and (*b*) the fact that light vectors at the focus of the wave are perpendicular to the ray paths associated with them. The inhomogeneity of amplitude is different for a Gaussian system and for one obeying the sine condition: the problem is solved for each of these cases, and conclusions are drawn concerning the limits within which the low-aperture formula is valid.

1050 535.323

Optical dispersion for coals. CANNON, C. G., AND GEORGE, W. H. *Nature, Lond.*, 151, *p.* 225, *Feb.* 20, 1943.—[See Abstr. 841 (1943)].

See Abstr. 1109 535.323 : 539.26 : 662.66 : 536.658.2

1051 535.33.03 : 535.338.1 = 3

Further investigations of organic substances by excitation with electron collision in the glow discharge. Mono- and di-derivatives of benzole. SCHÜLER, H., AND WOELDIKE, A. *Phys. Z.*, 43, 1–2, *pp.* 17–22, 1942.—Toluol, aethyl benzole, normal propyl benzole, iso-propyl benzole and meta-, ortho- and para-xylol, are investigated. In the ultra-violet ($\lambda = 2\,600$–$3\,400$Å) the emission spectra corresp. to the absorption. In the visible region ($\lambda = 3\,900$–$5\,700$ Å) new characteristic emission spectra are observed. The complex mol. C_6H_5 remains over in the excited state on the dissociation of these derivatives by excitation with electron collision. From purely spectroscopic data the energy of separation of CH_3 from the benzole ring in the case of toluol is $\leqslant 59\,000$ cal./mol. A comparison of the intensities of different spectra shows a difference in the yield of the electron collision for the different positions of the substituents in the derivatives. An explanation is given why no visible spectra of this kind occur with benzole and the mono-derivatives with the substituents Cl, Br, OH, CN, NH_2. [See Abstr. 376 (1943)]. H. G. S.

1052 535.33.07

An improved electrode holder for spectrographic analysis. SCRIBNER, B. F., AND CORLISS, C. H. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 41–45, *Jan.*, 1943.—Advantages afforded by the holder include: (1) application to a variety of electrode sizes and excitation conditions, (2) pos. and precise adjustment and motion of the parts, (3) water-cooling of the electrode clamps, and (4) a housing for protection against light, fumes and electric shock. The construction of the holder and its application to excitation problems with the h.v. spark, the a.c. arc and the d.c. arc are described.

1053 535.33.072

The infra-red prism spectrograph as a precision instrument. OETJEN, R. A., KAO CHAO-LAN, AND RANDALL, H. M. *Rev. Sci. Instrum.*, 13, *pp.* 515–523, *Dec.*, 1942.—An investigation of the working conditions of a recording infra-red spectrometer has resulted in techniques of operation which have increased the precision of the measurements. The remeasurement of the fine structure of certain of the absorption bands of CO_2, NH_3 and H_2O is reported. Measured with a grating instrument whose resolution was made to equal that of the prism instrument in each case, these data give 150 sharp absorption lines between 5 μ and 15 μ suitable for empirical calibration.

1054 535.337

Transition probabilities in the subordinate series of thallium. KWATER, G. S. *J. Phys., U.S.S.R.*, 6, 3–4, *pp.* 145–162, 1942.—The abs. values of the transition probabilities for the lines of the subordinate (sharp and diffuse) series of Tl have been measured by the hook method. Equations for the temperature dependence of the optical densities are obtained and the heat of evaporation of Tl at abs. zero is determined.

See Abstr. 1051 535.338.1 : 535.33.03 = 3

1055 535.338.332

Isotope shifts in some lines of nitrogen. HOLMES, J. R. *Phys. Rev.*, 63, *pp.* 41–46, *Jan.* 1 *and* 15, 1943.—The line spectrum of a mixture of 70 atom. % N^{15} to 30 atom. % N^{14} was photographed with a Fabry–Perot interferometer. The source was a liquid-air-cooled quartz tube with external electrodes excited by a 12 m. oscillator. The tube was charged with He at a few mm. pressure containing 0·03 mm. of the N isotope mixture. It was possible to resolve the 2 components due to N^{14} and N^{15} in 9 infra-red lines. No lines were found in the visible or ultra-violet. The lines arising from $^4P \rightarrow {}^4P$ and $^4S \rightarrow {}^4P$ transitions showed a neg. isotope shift of the order of 0·06 cm.$^{-1}$ Those from $^2P \rightarrow {}^2P$ transitions showed a pos. shift of the order of 0·07 cm.$^{-1}$

1056 535.339 = 3

Investigations on the astigmatism of mirror monochromators. DÜHMKE, M. *Phys. Z.*, 43, 3–4, *pp.* 33–42, 1942.—The conditions for good slit images with double-mirror monochromators and vario-illuminators are investigated. The arrangements used are illustrated diagrammatically with photographic reproductions of the slit images. The Czerny and Turner experiments on the astigmatism of mirror spectrometers [Abstr. 3111 (1930)] are repeated and confirmed, and are extended by the variation of the aperture ratio and by the slit images with the entrance slit rotated through 90°. H. G. S.

1057 535.345 : 535.81 = 3

On the optical transmission of quartz glass. SCHRAUB, A. *Phys. Z.*, 43, 3–4, *pp.* 64–69, 1942.—Measurements are made of the transmission of quartz glass over the wavelength range 212–644 mμ and are compared with existing data. Molten quartz, in contrast to crystalline, absorbs strongly towards the short wavelengths, starting at 260 mμ. The fluorescence which occurs is in the violet and neighbouring long-wave, ultra-violet region. The strong absorption referred to precludes the use of large quartz glass lenses and prisms for the purpose of obtaining high light intensities with spectroscopic apparatus.

H. G. S.

1058 535.37

The mechanism of luminescence of phosphors. ANTONOV-ROMANOVSKIJ, V. V. *J. Phys., U.S.S.R.*, 6, 3–4, *pp.* 120–140, 1942.—The mechanism of luminescence of alkali-halide phosphors activated by Tl is of a recombination character and this is why the alkali-halide phosphors do not represent a separate class of metastable phosphors, but must be referred to the same class as the alkali-earth phosphors.

1059 535.371

Phosphorescence of adsorbed trypaflavine and its quenching by oxygen. FRANCK, J., AND PRINGSHEIM, P. *J. Chem. Phys.*, 11, *pp.* 21–27, *Jan.*, 1943.—Dyes adsorbed at, or imbedded in, solids have a greater yield of fluorescence and phosphorescence than in liquid solutions. It is suggested that hindrance of the natural movement of the atoms in the dye mol. causes delay in the internal conversion of excitation energy into mol. oscillation energy. The green phosphorescence of trypaflavine adsorbed on silica gel is half quenched by O_2 at 5×10^{-5} mm. pressure; the quenching at higher O_2 pressures is smaller than expected. Water vapour does not quench the phosphorescence.

1060 535.371

Exaggerated phosphorescence of zinc silicate phosphors. FROELICH, H. C., AND FONDA, G. R. *J. Phys. Chem.*, 46, *pp.* 878–885, *Nov.*, 1942.—Measurements were made on Zn silicate phosphors containing traces of As, showing the character of their decay as well as of their initial rise in fluorescence during the induction period. The action of As is the same as that of other agents and consists in the formation of additional lattice defects which increase the number of trapping states.

1061 535.371 : 544

A new fluorescence reaction for the detection of boric acid. NEELAKANTAM, K., AND ROW, L. R. *Proc. Indian Acad. Sci. A*, 16, *pp.* 349–358, *Nov.*, 1942.—None of the metallic radicles examined interferes, while among the acid radicles chromate, bromate, chlorate, nitrite and fluoride do so to a limited extent. The test is applicable to micro-quantities of H_2BO_3.

1062 535.372

The fluorescence of phenylated anthracenes. HIRSHBERG, Y., AND HASKELBERG, L. *Trans. Faraday Soc.*, 39, *pp.* 45–48, *Feb.–March*, 1943.—Results obtained for a number of phenylated anthracenes are listed and compared with those for the parent substance. Every substitution in the anthracene system by a phenyl group increases the abs. intensity of fluorescence, and mono-phenylation of anthracene in 1 of the 3 possible positions shifts the fluorescence bands in approx. the same way.

1063 535.372

On the luminescence of fluorspar. RWATSCHEW, W. P. *J. Phys., U.S.S.R.*, 6, 3–4, *pp.* 141–144, 1942.—The spectra of natural CaF_2 in the ultra-violet and the decay at room and higher temp. are examined. A bimolecular photo-chemical process is probable.

1064 535.375.5

Raman spectra of hydrocarbons. I. 1-octene, *cis* + *trans* 2-octene, *trans*-3-octene, *trans*-4-octene, 4-octyne, and 1-octyne. CLEVELAND, F. F. *J. Chem. Phys.*, 11, *pp.* 1–6, *Jan.*, 1943.—The exp. arrangement is described. The intensities were determined by a micro-densitometer. The rel. intensities are based upon an arbitrary value of 1 000 for the strongest line. With a high-speed Hilger E-518 glass spectrograph, a spectrogram of CCl_4, from which 8 lines could be measured, was obtained in 1 min.

1065 535.375.5

A method for determining depolarization factors in Raman spectra. RANK, D. H., PFISTER, R. J., AND GRIMM, H. H. *J. Opt. Soc. Amer.*, 33, *pp.* 31–35, *Jan.*, 1943.—The method utilizes the spectral intensity traces obtained directly on a recording monochromator. A refrigerated multiplier phototube is used as a detector with additional d.c. amplification. The initial photo-current, amplified 10^8-fold, is continuously traced on a galvanometer deflection recorder of sensitivity 10^{-9} A/mm. Analysis of the partially polarized scattered Raman light is made by means of a polaroid oriented to obtain one record each for the parallel and perpendicular intensities.

See Abstr. 1213 535.375.5 : 541.132

1066 535.375.55

Raman frequencies of HDO. RAO, Y. P. *Indian J. Phys.*, 16, *pp.* 205–209, *Aug.*, 1942.—Mixtures of water and heavy water in 2 proportions—1 : 9 and 9 : 1—are studied. The Raman frequencies of HDO inferred from the spectra are 2 523 and 3 363. These results are compared with available data. Changes in the structure of the H_2O and D_2O bands are explained.

1067 535.379 : 667.2 = 3

Chemiluminescence of adsorbed dyestuffs. KAUTSKY, H., AND MÜLLER, G. O. *Naturwissenschaften*, 30, *p.* 315, *May* 15, 1942. H. G. S.

1068 535.412 = 3

On the position of the Fizeau interference bands with large path difference. HANSEN, G. *Phys. Z.*, 43, 1–2, *pp.* 15–16, 1942.—The visibility of the Fizeau bands is discussed. It is shown that their position is indeterminate by an amount = wedge thickness. H. G. S.

1069 535.421

An improvement in the design of the concave-grating spectrograph. BREWINGTON, G. P. *Rev. Sci. Instrum.*, 13, *pp.* 501–502, *Nov.*, 1942.

1070 535.43

Propagation of radiation in a scattering and absorbing medium. HULBURT, E. O. *J. Opt. Soc. Amer.*, 33, *pp.* 42–45, *Jan.*, 1943.—It is assumed that collimated radiation i_o and diffuse radiation a_o are incident on the upper surface of a horizontal slab of a medium which scatters and absorbs the radiation. Equations are derived for the streams of radiation flowing downward and upward, respectively. The equations are reduced to relations ref. to the optics of the sea and the sky.

1071 535.434

Optical problems of the ultracentrifuge. BRIDGMAN, W. B., AND WILLIAMS, J. W. *Ann. N.Y. Acad. Sci.*, 43, 5, *pp.* 195–210, 1942.—Methods of following sedimentation in an ultracentrifuge are compared and the fundamental principles of experimental assemblies are summarized. Also in the consideration of specific examples, answers to certain questions that are frequently raised in regard to the application of these methods have been given. [See Abstr. 2633 (1940)]. The methods based upon absorption and refraction of light are comprehensively discussed. H. H. HO.

1072 535.436 = 3

On interferences at axially oriented multi-atomic gas molecules. STEINER, O. *Naturwissenschaften*, 30, *p.* 121, *Feb.* 20, 1942. H. G. S.

1073 535.514 : 539.31 : 620.1

The photo-elastic analysis of transverse bending of plates in the standard transmission polariscope. DRUCKER, D. C. *J. Appl. Mech.*, 9, *A*161–*A*164, *Dec.*, 1942.—The procedure used is to "freeze" a high initial tension in bakelite or similar material, cut out the model at some angle to the direction of the tension, bend and observe. Results of various tests are given; photographs of 2 cases, the circular hole and the semi-circular notch, are included. Stress-concentration factors are obtained and analysed. The problem of the thick plate as contrasted with the thin plate, assumed in the usual theory, is discussed briefly.

1074 535.525

An aid in showing Mitscherlich's experiment. FARWELL, H. W. *Amer. J. Phys.*, 10, *p.* 332, *Dec.*, 1942.

See Abstr. 1242 535.563 : 541.63

1075 535.563 : 541.653

The diastereoisomerism of the 9,10,12-trihydroxystearic acids and the geometric configurations of ricinoleic and ricinelaidic acids. KASS, J. P., AND RADLOVE, S. B. *J. Amer. Chem. Soc.*, 64, *pp.* 2253–2257, *Oct.*, 1942.—The partial oxidation of ricinoleic and ricinelaidic acids with alkaline permanganate and with peracetic acid results in 4 distinct diastereoisomeric 9,10,12-trihydroxystearic acids formed in 2 inter-related pairs. The optical activities of the 4 trihydroxystearic acids were related to the *cis*- and *trans*-structures of the parent ricinoleic and ricinelaidic acids, respectively.

1076 535.641.2 = 3

A proposal for extending the Oswald colour system. ARENS, H. *Phys. Z.*, 43, 3–4, *pp.* 43–64, 1942.—The Oswald system is explained and its importance emphasized. The disadvantages of the method are discussed and proposals made for their elimination. Formulae are given with the aid of which the new Oswald co-ordinates in the $\bar{V}WS$ triangle can be determined from the known trichromatic colour co-ordinates. H. G. S.

1077 535.642

Vision: trichromatic theory: experimental studies. WALTERS, H. V. *Proc. Roy. Soc. B*, 131, *pp.* 27–50, *Sept.* 14, 1942. *Abstr. in J. Text. Inst., Manchr*, 33, p. *A*601, *Dec.*, 1942.—A repetition of an investigation of colour adaptation carried out by Wright has been made with an improved design of the Wright trichromatic colorimeter. The technique is described and the assumptions in the method for determining the fundamental response curves are discussed. E. R. A.

1078 535.642

Photo-electric tristimulus colorimetry with three filters. HUNTER, R. S. *Circ. U.S. Bur. Stand.* C429, [46 *pp.*], 1942.—Describes the characteristics of the filter-photocell combinations used in a multi-purpose photo-electric tristimulus colorimeter. The I.C.I. std. observer is fairly well reproduced except at the blue end of the spectrum. The methods of obtaining colorimetric data from the photo-electric tristimulus data are described and the errors, both instrumental and those due to short cuts in computation, are discussed. The paper concludes with a summary of the advantages and disadvantages of the method and with a full bibliography. J. W. T. W.

1079 535.642

Adaptation in colour space. SPENCER, D. E. *J. Opt. Soc. Amer.*, 33, *pp.* 10–17, *Jan.*, 1943.—Examines whether it is possible to introduce the effect of adaptation into the system of colour specification, and concludes that this may be done by introducing a new concept, termed the composite stimulus, and by adding a single new tensor. A good correlation is found betw. the composite stimulus, calculated as described in the paper, and experimental data on sensations evoked by the corresp. stimuli.

J. W. T. W.

1080 535.65

A method of preparing strips with uniformly varying blackening. BARR, E. S., AND SCOTT, L. B. *Rev. Sci. Instrum.*, 13, *pp.* 533–534, *Dec.*, 1942.—The method consists of supporting the strip on a properly curved form which is illuminated by a beam of parallel light during exposure.

See Abstr. 1046 535.65 : 535.247.4

1081 535.668

Calculation of the colour of pigmented plastics. SAUNDERSON, J. L. *J. Opt. Soc. Amer.*, 32, *pp.* 727–736, *Dec.*, 1942.—Assuming that the optical properties of a pigment can be described by two const. only, viz. the absorption and the scattering coeff., the author shows that it is possible to develop a simple method for determining the optical const. of mixtures of dyes and pigments and so to calculate the colour of any specified pigment mixture. The use of the method to give the composition of the mixture needed for a colour match with a given sample is explained. J. W. T. W.

1082 535.68

The nature and causes of small colour differences in industry. Lighting for their detection. TAYLOR, A. H. *J. Opt. Soc. Amer.*, 32, *pp.* 651–658, *Nov.*, 1942.—Analyses of spectral transmittance and reflectance curves are given for different materials—papers, paints and translucent plastics—to illustrate the part played by the thickness of the material and the background on which the coating is applied or against which the object is viewed in producing small colour differences. Reflectance curves are given showing the effect of refining a porcelain enamel, tinting a white paint and removing water by screening in the manufacture of coloured bond paper. Fading of textiles by daylight and artificial light is considered. Colour matching and lighting for revealing small colour differences are discussed. H. G. S.

1083 535.7 : 628.93

War-time and blackout lighting in relation to the eye. FERREE, C. E., AND RAND, G. *Illum. Engng, N.Y.*, 37, *pp.* 579–595, *Nov.*, 1942.—[Abstr. 1139 B (1943)].

See Abstr. 1057 535.81 : 535.345 = 3

See Abstr. 1190 535.81 : 539.4.016.3

1084 535.82 = 3

On the Abbe theory of the microscope and the related questions of coherence. JOOS, G., AND KÖHLER, A. *Naturwissenschaften*, 30, *pp.* 553–563, *Sept.* 11, 1942.—In support of the Abbe theory of the formation of the images in the microscope the conditions of coherence and the imaging of self-luminous and non-self-luminous bodies are discussed in detail. H. G. S.

1085 535.822.4

The theory of the microscope. III. Boundary waves in dark-ground illumination. MARTIN, L. C. *Proc. Phys. Soc., Lond.*, 55, *pp.* 104–116, *March*, 1943.—[See Abstr. 1153 (1934)]. The theory of boundary diffraction waves (Young, Maey, Rubinowicz) is developed in order to deal with the theory of image formation in the dark-ground field, subject to the assumption of simplified conditions. Some confirmatory exp. are described. Attention is directed to certain anomalous results which may appear.

HEAT. THERMODYNAMICS

1086 536.2.08 : 621.317.39

Terminal corrections for temperature tests on short samples. BAUER, F., AND TAYLOR, J. J. GOODWIN, W. N., JR. *Elect. Engng, N.Y.*, 61, *pp.* 584–585, *Nov.*, 1942, *and Corresp.*, 62, *p.* 49, *Jan., and pp.* 83–84, *Feb.*, 1943.—[Abstr. 1020 B (1943)].

1087 536.24 : 536.423.4

Condensation of saturated Freon-12 vapour on a bank of horizontal tubes. YOUNG, F. L., AND WOHLENBERG, W. J. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 787–794, *Nov.*, 1942.—The condensate film formed on tubes below the top in a vertical bank of horizontal tubes differs from that formed on the top tube because condensate runs off to lower tubes, thus affecting the rate of heat transfer at the lower tubes. The paper includes results of an exp. investigation of such effects.

1088 536.24.01 : 532.5

The analysis of a continuous process by a discontinuous step method. HRONES, J. A. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 753–758, *Nov.*, 1942.—A heat exchanger was subjected to a known input-temperature disturbance, and the dynamic response of the output temperature was calculated and measured. It was assumed that the physical conditions could be approximated by considering the heat-exchanger tube to be divided into sections. The heat exchanger is represented by a hydraulic analogue.

1089 536.24.023

A review of heat-transfer coefficients and friction factors for tubular heat exchangers. SHORT, B. E. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 779–785, *Nov.*, 1942.—A summary of exp. and analytical work on heat-transfer rate and pressure drop on the shell side of shell-and-tube exchangers. No rational base has been established, except in so far as the fluid pro-

perties, fluid velocity and dimensions of the exchangers are involved.

1090 536.24.023

Heat transfer, pressure drop, and fouling rates of liquid for continuous and non-continuous longitudinal fins. GUNTER, A. Y., AND SHAW, W. A. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 795–804, *Nov.*, 1942.—Test data on continuous and non-continuous fins for liquids in the laminar-flow region. For longitudinal fin-tube "pipe-within-pipe" type heat exchangers, the transition range begins near $R_h = 200$. Non-continuous fins promote turbulence and increase fin-side heat-transfer coeff. up to 100%. The theoretical aspects of fouling on fin tubes *v.* bare tubes are illustrated. Fin tubes are affected less by fouling than bare tubes.

1091 536.244

The repulsive action between a heated solid surface and the adjacent gas. I. SPENCER-GREGORY, H. *Phil. Mag.*, 34, *pp.* 120–130, *Feb.*, 1943.—The repulsive action betw. a heated solid and the adjacent gas is discussed generally from aspects when the gas is both partially and strongly rarefied. The paper is concerned with a uniformly heated thin wire under conditions of partial rarefaction. The repulsive action depends in magnitude on the temperature discontinuity betw. the gas and wire surface. The reciprocal of the repulsive force satisfies a linear relation with the reciprocal of the pressure, a relation which is of the same form as the law of heat conduction through the gas, modified in resp. of the temperature drop effect. The results are also given for a spherical and a parallel-plate distribution of temperature, and calculated values of the repulsive forces are tabulated for the gases He and H_2. An outline of the theoretical difficulties arising from the existence of a temperature gradient along the wire surface, together with a summary of the theoretical procedure to be observed, is given.

1092 536.245 : 629.118

Report of the Automobile Research Committee on the design of cooling fins for motor-cycle engines. LAMARQUE, P. V. *J. Instn Auto Engrs*, 11, *pp.* 99–133, *March*, 1943.—The general design and installation features affecting engine cooling are considered, and the factors controlling fin design assessed from the results of tests on uniformly heated dummy cylinders in a wind tunnel. These tests also yielded information on the value of the heat transfer coeff. for a number of fin arrangements. Corrections to the factors concerned for conditions other than those considered in the tests are presented, and an equation is given rel. the heat transfer from finned cylinders with the fin dimensions and the surface heat transfer coeff. An examination is made of the proportion of the total heat dissipated from the cylinder head and from the barrel. Notes are included on the cowling of air-cooled engines.

1093 536.413.2

Thermal expansion of some bronzes. HIDNERT, P. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 75–88, *Jan.*, 1943.—The results of tests on the linear expansion of 4 groups of bronzes designated as Sn-Zn, Pb, Al and Si bronzes, are given for different temp. ranges. Curves showing the expansion and contraction characteristics are presented. Ternary diagrams are given.

1094 536.413.2

Thermal expansion of titanium. HIDNERT, P. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 101–106, *Feb.*, 1943.—Data on the linear expansion of Ti (97·2%) betw. − 190° and + 700°C. The coeff. of expansion increases from 5×10^{-6} deg. C. at − 150°C. to 12×10^{-6}/deg. C. at 650°C. The data do not indicate polymorphic transformations.

1095 536.413.2 : 621.317.39

Electrical extensometers. STETTLER, O. *Flugwehr u. Techn.*, 4, *pp.* 212–214, *Aug.*, 1942.—[Abstr. 1021 B (1943)].

1096 536.413.2.08 : 621.317.39

A recording dilatometer. STANTON, L. R. *Iron Coal Tr. Rev.*, *pp.* 87–89, *Feb.* 5, 1943.

1097 536.413.3

Coefficient of expansion of solids. RAO, M. R. *Curr. Sci.*, 11, *pp.* 430–431, *Nov.*, 1942.—[See Abstr. 1675, 1685 (1942)].

See Abstr. 1021 536.421.1 + 531.75] : 546.23

1098 536.421.4 : 541.66

Compound formation between the isomeric phenyl-phenols and pyridine. HAZLET, S. E., AND MORROW, R. W. *J. Amer. Chem. Soc.*, 64, *pp.* 2625–2628, *Nov.*, 1942.—The f.p./composition diagrams have been determined for the 2 component systems of pyridine and of the 3 isomeric phenyl-phenols.

1099 536.423.1 : 541.66

Studies of the physical properties of alicyclic hydrocarbons. II. Boiling points of monocyclic hydrocarbons. EGLOFF, G., AND KUDER, R. C. *J. Phys. Chem.*, 46, *pp.* 934–945, *Nov.*, 1942.—In isomeric alkylcyclanes containing the same ring the b.p. is lowered by increasing the number of side chains. Among isomeric dialkylcyclanes differing only in position of the alkyl groups the 1,2-dialkyl isomer has the highest b.p. and the 1,1-dialkyl isomer the lowest. *Cis* compounds boil as much as 7·5°C. higher than the corresp. *trans* isomers. A Type I double bond lowers the b.p. A Type II double bond also lowers the b.p. except in cyclohexenes. Double bonds of Types IV and V cause b.p. above those of the corresp. alkylcyclanes. The b.p. of isomeric alkylcyclenes differing only in the type of double bonds increase as the type number increases. Conjugation of double bonds consistently raises the b.p. only if 1 of the bonds is cyclic and the other is in the α-position in the side chain. Introduction of a triple bond into an alicyclic hydrocarbon raises its b.p.

See Abstr. 1037 536.423.15 : 532.712 : 532.77

1100 536.423.15 : 536.655 : 539.155.2 : 541.12.013

The differences in the vapour pressures, heats of vaporization, and triple points of nitrogen (14) and nitrogen (15) and of ammonia and trideuteroammonia. KIRSHENBAUM, I., AND UREY, H. C. *J. Chem. Phys.*, 10, *pp.* 706–717, *Dec.*, 1942.—The differences in the v.p. of natural N and samples containing 34·6% of N^{15} are measured by a differential method and represented by an expression. The difference in the heats of vaporisation are calculated, and the triple-point pressures measured, from which the difference in the triple points is calculated. Assuming Raoult's law, expressions are found for the v.p. and difference

n heats of vaporization of N^{14} and N^{15}. The triple point of pure N^{15} is 0·058° higher than that of N^{14}, and the b.p. 0·052° higher. From measurements are obtained equations for the differences in the v.p. of solid NH_3 and solid ND_3 containing 98% D, and for the v.p. of the liquid forms, the two equations agreeing at the triple point. N. M. B.

1101 536.423.15 : 537.226.1 : 532.62

Vapour pressure and electrodynamic volume of suspensions. Löwy, H. *Phil. Mag.*, 34, *pp.* 101–105, *Feb.*, 1943.—A relation betw. v.p. and dielectric const. of suspensions is obtained from the equation connecting v.p. and curvature of a liquid surface, and the electrodynamic vol. of the suspension. The theory leads to conclusions concerning the biology of desert plants and the H_2O content of desert soils. A. J. M.

See Abstr. 1087 536.423.4 : 536.24

1102 536.423.45 : 621.365 : 621.317.39

Accurate dew-point indication for atmospheres of heat-treating furnaces. Kalischer, P. R. *Steel*, 111, *pp.* 110–111, *Sept.* 14, 1942. *Abstr. in Bull. Iron Steel Inst., p.* 55*A*, *Dec.*, 1942.—[Abstr. 1023 B (1943)].

1103 536.5 : 621.317.39

Temperature measurement and control by electronics. Walsh, C. *Electronics*, 15, *pp.* 56–61 *and* 94, *Oct.*, 1942.—[See Abstr. 1024 B (1943)].

1104 536.532 : 621.317.79

Thermocouples. Lancaster, H. B., and Brunot, A. W. *Gen. Elect. Rev.*, 45, *pp.* 649–652, *Nov.*, 1942.—[Abstr. 1036 B (1943)].

1105 536.624

The heat capacity of organic vapours. III. A comparison of flow calorimeters. Montgomery, J. B., and Vries, T. De. *J. Amer. Chem. Soc.*, 64, *pp.* 2372–2375, *Oct.*, 1942.—A study of flow calorimeters for the determination of the heat capacity of organic vapours. A recycling vaporizer for producing a const. rate of vapour flow was designed.

1106 536.627 : 621.317.39

Cooling, dehumidifying. Whitesel, H. A. *Gen. Elect. Rev.*, 45, *pp.* 653–656, *Nov.*, 1942.—[Abstr. 1025 B (1943)].

1107 536.633

Empirical heat-capacity equations of gases. Spencer, H. M., and Flannagan, G. N. *J. Amer. Chem. Soc.*, 64, *pp.* 2511–2513, *Oct.*, 1942.

See Abstr. 1031 536.654 : 532.614.2 = 3

See Abstr. 1100 536.655 : 539.155.2 : 541.12.013 : 536.423.15

1108 536.658 : 532.696 : 541.183.55

Adsorption and the energy changes at crystalline solid surfaces. Boyd, G. E., and Livingston, H. K. *J. Amer. Chem. Soc.*, 64, *pp.* 2384–2388, *Oct.*, 1942.—(1) The free-energy change upon immersion in a saturated vapour for TiO_2, SiO_2, $BaSO_4$, SnO_2 and graphite is determined by graphical integration of vapour-adsorption data, utilizing the Gibbs adsorption relation. (2) The free surface-energy change upon immersion in bulk liquid is obtained from the data of (1) combined with the contact-angle equation. The data of (2) are employed to obtain the work of adhesion of a liquid to a solid surface, and to determine values of the changes in free energy associated with the spreading of a liquid as a duplex film over a crystal face. An examination of the free-energy changes for solids and liquids where the contact angle is > 0 indicates that, although a duplex film cannot exist, a monolayer may cover the solid surface.

1109 536.658.2 : 539.26 : 535.323 : 662.66

The physical properties and physical structure of coals. Cannon, C. G. *J. Inst. Fuel*, 16, *pp.* 51–60, *Dec.*, 1942.—[Abstr. 1144 B (1943)].

See Abstr. 1216 536.66 : 536.75 : 536.77 : 541.132 : 541.134

1110 536.662 : 536.77

Thermal data. XV. The heats of combustion and free energies of some compounds containing the peptide bond. Huffman, H. M. *J. Phys. Chem.*, 46, *pp.* 885–891, *Nov.*, 1942.—Exp. data for the heats of combustion of 4 compounds containing the peptide bond are given. The free-energy change on hydrolysis of each of these compounds is calculated.

1111 536.662 : 541.552

The apparent energy of the N-N bond as calculated from heats of combustion. Anderson, C. M., and Gilbert, E. C. *J. Amer. Chem. Soc.*, 64, *pp.* 2369–2372, *Oct.*, 1942.—New data for isothermal heats of combustion of tetraphenylhydrazine and *sym*-dibenzoylhydrazide are reported. Revisions of earlier data for aniline, benzamide, diphenylamine and phenylhydrazine are given. Values are computed for the energy of the N-N bond in tetraphenylhydrazine, *sym*-dibenzoylhydrazide, hydrazobenzene and phenylhydrazine.

1112 536.666

Heats of organic reactions. XIV. The digestion of β-lactoglobulin by pepsin. Haugaard, G., and Roberts, R. M. *J. Amer. Chem. Soc.*, 64, *pp.* 2664–2671, *Nov.*, 1942.

See Abstr. 1220 536.7 : 541.136.1

See Abstr. 1197 536.7 : 669.018 : 541.121 = 3

1113 536.75

Entropy. Darrow, K. K. *Bell Syst. Techn. J.*, 21, *pp.* 51–74, *June*, 1942.—A general discussion of statement and meaning.

1114 536.75

Nature of entropy. Allen, H. S. *Nature, Lond.*, 151, *pp.* 225–226, *Feb.* 20, 1943.—[See Abstr. 872 (1943)].

See Abstr. 1216 536.75 : 536.77 : 541.132 : 536.66 : 541.134

See Abstr. 1110 536.77 : 536.662

See Abstr. 1216 536.77 : 541.132 : 536.66 : 536.75 : 541.134

ELECTRICITY. MAGNETISM

See Abstr. 1015 537.122 : 530.145.63

1115 537.226 : 537.529 : 621.315.617.3

Intrinsic electric strength and conductivity of varnish films and their variation with temperature. Thomas, A. M., and Griffith, M. V. *Rep. Brit. Elect. Allied Industr. Res. Assoc., Ref. L/T120. J. Instn Elect. Engrs*, 89, *Part I, pp.* 487–498, *Nov.*, 1942.—[Abstr. 979 B (1943)].

See Abstr. 1248 537.226 : 621.315.616.96 : 541.67

See Abstr. 1101 537.226.1 : 532.62 : 536.423.15

See Abstr. 1034 537.226.2 : 532.739.2

1116 537.311.1 : 621.315.59 = 3

On the mechanism underlying the behaviour of non-linear resistors. BRAUN, A., AND BUSCH, G. *Helv. Phys. Acta*, 15, 6, *pp.* 571–612, 1942.—[Abstr. 971 B (1943)].

1117 537.311.35 : 591.85 : 621.317.332 = 3

Absorption measurements with biological liquids (blood) in the wavelength region 50–100 cm. GSELL, G. *Phys. Z.*, 43, 5–6, *pp.* 101–106, 1942.—[Abstr. 1014 B (1943)].

1118 537.312.6 : 621.316.771

Two new hot-filament resistances. MINTER, C. C. *J. Appl. Phys.*, 14, *pp.* 49–50, *Jan.*, 1943.—[Abstr. 1003 B (1943)].

1119 537.312.62

The magnetic behaviour of supraconducting alloys of Sn-Zn. LAZAREV, B. G., AND NAKHUTIN, I. E. *J. Phys., U.S.S.R.*, 6, 3–4, *pp.* 116–119, 1942.—The critical fields and temperatures of the alloys coincide with those for Sn. Very small particles of Sn which could change the critical fields are not present in the alloys in any noticeable quantity. In low fields the curves for the magnetic moment of the investigated alloys, and even of the alloy containing 10% of Sn, do not differ from the curves for the pure supraconductor.

1120 537.312.8

The anomalous dependence of the resistance of zinc on a magnetic field. NACHIMOVICH, N. M. *J. Phys., U.S.S.R.*, 6, 3–4, *pp.* 111–113, 1942.—Results of measuring the dependence of the resistance of a Zn single crystal on the transverse magnetic field at liquid-He temperature.

1121 537.323 : 669.12 : 621.362

Thermo-electric power of very pure iron between 20° and 230°C. THOMPSON, F. C., AND SAHA, N. C. *J. Iron Steel Inst.*, [7 *pp.*], 1943. *Advance copy.*—[Abstr. 1066 B (1943)].

1122 537.361

A new method for the determination of electrokinetic potential in the flow of a semiconducting liquid through a single capillary. EVERSOLE, W. G., AND BOARDMAN, W. W. *J. Phys. Chem.*, 46, *pp.* 914–926, *Nov.*, 1942.—A new method for obtaining data to be used in calculating true electrokinetic potentials is described. The abnormal course of the ek.p. *v.* conc. of KCl solutions, where the ek.p. is obtained by the Helmholtz–Smoluchowski equation, may be attributed to surface conductance of the capillary walls. There is a relation betw. ek.p. and the potential resulting from the flow of dilute solutions through a Pt capillary.

1123 537.361

The relation between ζ-potential and the electrical capacitance of the double layer. EVERSOLE, W. G., AND ESTEE, C. R. *J. Chem. Phys.*, 11, *pp.* 63–74, *Feb.*, 1943.—The usual calculation of the electrical capacitance of the double layer from ζ-potentials is in error because (1) the electrogravitational plane of the outer charge is not at a distance $1/\kappa$ and (2) the inner charge is not in the ζ-potential plane. An equation is derived which makes allowance for the distribution of charge on both sides of the ζ-potential plane. Calculations from ζ-potentials of glass in dilute aqueous solutions of simple salts give values which increase from $1\mu F/cm.^2$ at 10^{-5} molar to $25\mu F/cm.^2$ at high salt conc. (1 molar). The equations are related qualitatively to electrocapillary phenomena.

See Abstr. 1115 537.529 : 537.226 : 621.315.617.3

1124 537.533.72 : 621.385.833

Thin electrostatic lenses for electrons. COPELAND, P. L. *Amer. J. Phys.*, 10, *pp.* 236–245, *Oct.*, 1942.—[Abstr. 1090 B (1943)].

1125 537.533.74

Electron polarization. SHULL, C. G., CHASE, C. T., AND MYERS, F. E. *Phys. Rev.*, 63, *pp.* 29–37, *Jan.* 1 *and* 15, 1943.—The double scattering exp. has been repeated with a 400 ekV beam of electrons from a van de Graaff electrostatic generator. The electrons are scattered by thin Au foils and counted. After eliminating spurious asymmetries, a polarization asymmetry of 8% for Au foils is found, which becomes 1% in the opp. direction when an Al foil is inserted instead. A reflection polarization exp. produces a smaller asymmetry than a transmission exp.

1126 537.533.74

The effect of oblique incidence on the conditions for single scattering of electrons by thin foils. GOERTZEL, G., AND COX, R. T. *Phys. Rev.*, 63, *pp.* 37–40, *Jan.* 1 *and* 15, 1943.—With electrons obliquely incident on the foil, serious deviations may be caused by the combination of 2 deflections of the same order of magnitude. The difference observed betw. the scattering at 90° to the 2 sides of a foil on which electrons are incident at 45° may be ascribed to this cause.

1127 537.533.74

The polarization of electrons. TROUNSON, E., AND SIMPSON, J. A., JR. *Phys. Rev.*, 63, *p.* 55, *Jan.* 1 *and* 15, 1943.

1128 537.533.79 : 77

The photographic action of electrons in the range between 40 and 212 kilovolts. BAKER, R. F., RAMBERG, E. G., AND HILLIER, J. *J. Appl. Phys.*, 14, *p.* 39, *Jan.*, 1943.—Errata. [Abstr. 2630 (1942)].

See Abstr. 1042 537.533.9 : 535.13

1129 537.534.74

Scattering of protons by magnesium nuclei. WRENSHALL, G. A. *Phys. Rev.*, 63, *pp.* 56–57, *Jan.* 1 *and* 15, 1943.—[See Abstr. 2406 (1941)].

1130 537.58

A direct experimental determination of the electron affinity of chlorine. MCCALLUM, K. J., AND MAYER, J. E. *J. Chem. Phys.*, 11, *pp.* 56–63, *Feb.*, 1943.—The electron affinity of Cl has been determined (85·84 ± 1·0 kcal./mole) by measuring the ratio of ions to electrons leaving a hot W surface in contact with a low pressure of gas containing Cl atoms. Both Cl_2 and $SnCl_4$ were used as carrier gases.

1131 537.591.15 = 3

The spatial and angular distribution of the particles in cosmic-ray air showers. MOLIÈRE, G. *Naturwissenschaften*, 30, *pp.* 87–89, *Jan.* 30, 1942. H. G. S.

1132 537.7 : 389.6 : 621.317

Standards of electrical measurement. HARTSHORN, L.

J. Instn Elect. Engrs, 89, *Part I*, *pp.* 526–535, *Dec.*, 1942.—[Abstr. 1010 B (1943)].

1133 537.71 : 538.213 : 621.3.081 = 3

On the statement of permeability values and the magnetic units. Remarks on the technique of equations. FISCHER, J. *Phys. Z.*, 43, 1–2, *pp.* 24–28, *Jan.*, 1942. H. G. S.

1134 537.71 : 621.3.081 = 3

Electromagnetic magnitudes and units. MARTINEZ, J. P., SOMMERFELD, A. *Phys. Z.*, 43, 1–2, *pp.* 22–24, 1942.—A discussion of the physical nature of B and H and their association in defining the electrical and magnetic quantities. [See Abstr. 94 (1936)]. H. G. S.

1135 538.14

On the theory of magnetization and hysteresis curves of polycrystalline ferromagnetics. KONDORSKY, E. *J. Phys., U.S.S.R.*, 6, 3–4, *pp.* 93–110, 1942.—Gives an approx. theory of the magnetization of polycrystalline ferromagnetic bodies with regard to the magnetic interaction betw. their parts. Ferromagnetics consisting of regions with 1 axis of easy magnetization are examined. A general equation is given for such ferromagnetics which connects mean magnetization with field strength, and a connection is established betw. the magnetization and hysteresis curves. A theoretical formula is derived for the hysteresis loop in the region of weak fields and for the dependence of hysteresis losses on field strength. The solution of the equation when the parts have similar structure and form and when the axes of easy magnetization are distributed at random is considered. Theoretical curves are compared with the curves of actual materials.

See Abstr. 1133 538.213 : 537.71 : 621.3.081 = 3

1136 538.22 : 541.128

The influence of the transition from ferromagnetism to paramagnetism on catalytic activity. COHN, G., AND HEDVALL, J. A. *J. Phys. Chem.*, 46, *pp.* 841–847, *Nov.*, 1942.—The catalytic activity of ferromagnetic substances is changed by the transition from ferromagnetism to paramagnetism. The activation energy of the decomposition of formic acid by a Co-Pd alloy is increased by 30% by the transition to the paramagnetic state of the catalyst.

1137 538.24 : 621.3.013.1

An analytic approach to the hysteresis loop. WEYGANDT, C. N., AND CHARP, S. *Elect. Engng, N.Y.*, 61, *pp.* 387–388, *July*, 1942.—[Abstr. 933 B (1943).

1138 538.3 : 621.396.671 : 621.392.5 = 3

Reciprocity theorem of the electromagnetic field. DÄLLENBACH, W. *Arch. Elektrotechn.*, 36, *pp.* 153–165, *March* 31, 1942.—[Abstr. 842 B (1943)].

1139 538.3(09)

Some aspects of the electromagnetic field. PAGE, L. *Elect. Engng, N.Y.*, 61, *pp.* 511–516, *Oct.*, 1942.—Traces the development of electromagnetic theory from the 18th century to modern theories. E. R. A.

1140 538.312 : 621.3.016.4

Energy flow in electric systems—the *Vi* energy-flow postulate. SLEPIAN, J. *Elect. Engng, N.Y.*, 61, *pp.* 835–841, *Dec.*, 1942.—[Abstr. 936 B (1943)].

1141 538.551.21

The steady-state response of circuits. WAIDELICH, D. L. *Communications*, 22, *pp.* 14, 16–18 *and* 46, *Oct., and pp.* 13–14, *Nov.*, 1942.—The steady state may be specified exactly for linear networks, although for the non-dissipative linear networks one of the infinite number of possible steady states must be chosen. For a non-linear network a more general definition of the steady state appears to be necessary. The steady-state response of a circuit can always be expressed in Fourier series, but may also be expressed as a sum function of the series. Another method of calculating the sum function is given, which is not directly applicable to non-dissipative networks. Methods for such networks are indicated. A. W.

1142 538.652.087 : 621.317.4.082.5

Magnetostriction made visible. LEONARD, S. C. *Gen. Elect. Rev.*, 45, *pp.* 637–641, *Nov.*, 1942.—An optical method of measuring the effect of a magnetic field on the length of a specimen in the direction of the applied field is described. Elongation or contraction of from $0{\cdot}5$ to 80×10^{-6} in. can be observed and a photo-electric-recording type fluxmeter records magnetostriction against flux density. A control strip which automatically compensates for any temperature effects is included and the error is within $\pm 2\%$. No exact correlation between audio-sound and magnetostriction is derived. M.-V.

1143 538.662.13 : 548

On the theory of phase transitions of the second order. I. Changes of the elementary cell of a crystal in phase transitions of the second order. LIFSHITZ, E. M. *J. Phys., U.S.S.R.*, 6, 1–2, *pp.* 61–74, 1942.—The possible changes in the symmetry of a crystal in phase transitions of the second order are essentially limited by the thermodynamic theory of these transitions. All possible changes of the elementary cell of a crystal in phase transitions of the second order are examined in this work.

MOLECULAR AND ATOMIC PHYSICS

See Abstr. 1194 539.016.3 : 620.1 : 539.531

1144 539.13 : 541.57

Spectroscopic evidence of intermolecular transfer of protons. WILLIAMS, D., AND STALLCUP, W. D. *J. Amer. Chem. Soc.*, 64, *pp.* 2684–2686, *Nov.*, 1942.—When a mixture of MeOH and BuOD is fractionated, MeOH and MeOD are both present in the recovered methanol and BuOH and BuOD are both present in the recovered butanol. The intermolecular H bonds involve the actual transfer of protons betw. molecules.

1145 539.132

The asymmetric rotor. I. Calculation and symmetry classification of energy levels. KING, G. W., HAINER, R. M., AND CROSS, P. C. *J. Chem. Phys.*, 11, *pp.* 27–42, *Jan.*, 1943.—A table of energy-level patterns for rigid asymmetric rotors is given, by which this approx. to the rot. energies of all molecules up to $J = 10$ may be evaluated. The symmetry classification of each level is determined and expressed in terms of the K values of the lim. prolate- and oblate-symmetric rotors. A method is developed for calculating the transformation which diagonalizes the energy matrix and is applied to the derivation of perturbation formulae.

1146 539.133 : 541.57

The structures of dimethyl boron fluoride and methyl boron difluoride. BAUER, S. H., AND HASTINGS, J. M. *J. Amer. Chem. Soc.*, 64, *pp.* 2686–2691, *Nov.*, 1942.—

An electron-diffraction study of dimethyl boron fluoride and methyl boron difluoride leads to the following: the molecules are planar, $B(CH_3)_2F$: B–F = 1·29 ± 0·02 Å; B–C = 1·55 ± 0·02 Å; C–F = 2·48 ± 0·03 Å. BCH_3F_2: B–F = 1·30 ± 0·02 Å; B–C = 1·60 ± 0·03 Å; C–F = 2·53 ± 0·03 Å.

1147 539.133 = 3

On the linear effect of the electric field in the ammonia molecular-ray experiment. SCHEFFERS, H. *Phys. Z.*, 43, 1–2, *pp.* 6–10, 1942.—[See Abstr. 2233 (1940)]. The effects of the translations and rotations of the molecule and the mol. vibrations are discussed. The rigid mol. model (pyramid) affords no explanation of the discrepancy. This is to be found by taking into account the oscillations of the N atom passing through the plane of the H atom. The moment which becomes effective in the molecular-ray exp. is therefore reduced compared with the true moment, and compatibly with the experimental results. The former proof of the linear effect remains unaffected.

H. G. S.

1148 539.152.1 : 530.12

The relativistic theory of excited spin states of the proton and the neutron. GINSBURG, V. L. *Phys. Rev.*, 63, *pp.* 1–12, *Jan.* 1 *and* 15, 1943.—The relativistic theory for the particle capable of being in the state with spin $\frac{1}{2}$ and the rest mass m_1, as well as in the state with spin $\frac{3}{2}$ and the rest mass $m_2 > m_1$ is developed. The cross-section for the scattering of light (of mesons) by the magnetic (by the quasi-magnetic) moment of such a particle increases at first with energy. For photons with energies $h\nu >> (m_2 - m_1)c^2$ the cross-section becomes const. (the recoil for the heavy particle being neglected).

1149 539.155.2

The ratio rule. NOETHER, H. D. *J. Chem. Phys.*, 11, *pp.* 97–99, *Feb.*, 1943.—An empirical rule for calculating the frequencies of isotopic groups in molecules is proposed and exp. evidence for it reported.

1150 539.155.2

Chemical separation of the isotopes of hydrogen by the addition of metals and compounds of metals to water, acids and bases. I. Relative efficiencies of specific reactions. The effects of certain factors other than temperature. JOHNSTON, H. L., AND DAVIS, C. O. *J. Amer. Chem. Soc.*, 64, *pp.* 2613–2620, *Nov.*, 1942.—Quantitative data were secured on the extent of isotopic separation in the following reactions which liberate H or gaseous hydrides: Li, Na, K, Ca, CaC_2 and Al_4C with water; Mg, Zn, Fe, Mn, Al and FeS with aq. H_2SO_4; and Al with aq. NaOH. The data confirm the applicability of the quantitative relationship $d \ln [H] = \alpha d \ln [D]$, in which [H] and [D] are instant. values and α is the isotopic separation factor.

See Abstr. 1100 539.155.2 : 541.12.013 : 536.655 : 536.423.15

1151 539.155.2 = 3

Isotope report 1941. FLÜGGE, S., AND MATTAUCH, J. *Phys. Z.*, 43, 1–2, *pp.* 1–5, 1942.—Details are given of new determinations and corrections of nuclear masses, rel. abundances and atom. wt. since 1940 [Abstr. 1381 (1941)]. H. G. S.

1152 539.16.08

Miniature Geiger–Müller counter. CURTISS, L. F. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 157–158, *Feb.*, 1943.—A miniature tube counter having a tube 0·8 mm. internal dia. is described. This hypodermic-needle type of counter is useful in locating and measuring a well-defined beam of γ-radiation.

1153 539.16.08

Saturation characteristics for alpha-particles in purified gases. KLEMA, E. D., AND BARSCHALL, H. H. *Phys. Rev.*, 63, *pp.* 18–23, *Jan.* 1 *and* 15, 1943.—Saturation curves were taken in N, A and an A–H mixture. The effect of purification on the saturation properties of A and the A–H mixture was studied. Even unpurified tank A and N show saturation at very much smaller field strengths than air. Upon purification an appreciable lowering of the field necessary for saturation was observed.

1154 539.16.08

The preparation and efficiency of the fast Geiger–Müller counter. ROCHESTER, G. D., AND JÁNOSSY, L. *Phys. Rev.*, 63, *pp.* 52–54, *Jan.* 1 *and* 15, 1943.—The dependence of the eff. of the fast Geiger–Müller counter upon the partial pressures of argon and alcohol is investigated. No change in the eff. of an argon-alcohol counter is found when the pressure of the argon is changed from 11 cm. to 74·5 cm.; a change exceeding 0·5% is incompatible with the results.

See Abstr. 993 539.16.08 : 519.251

1155 539.16.08 : 531.15

High centrifugal fields and radioactive decay. FREED, S., JAFFEY, A. H., AND SCHULTZ, M. L. *Phys. Rev.*, 63, *pp.* 12–17, *Jan.* 1 *and* 15, 1943.—Except for fission, an example of each type of radio-active decay was investigated. Two methods were employed, one of which made use of a toroidal tube counter surrounding the spinning rotor. No definite effect was found.

1156 539.16.08 : 621.385.8

Use of a double triode as a pulse-lengthener. SHEPPARD, C. W. *Rev. Sci. Instrum.*, 13, *p.* 534, *Dec.*, 1942.—[Abstr. 1088 B (1943)].

1157 539.163 = 3

On the isolation and some of the properties of element 93. STRASSMANN, F., AND HAHN, O. *Naturwissenschaften*, 30, *pp.* 256–260, *April* 24, 1942.—A method of separating element 93 quantitatively from U, UX and the fission products is described. Details of its properties are given. The differences betw. it and U are considerably greater than betw. the most easily separated rare earths La and Ce. H. G. S.

1158 539.163 : 550.42 = 3

Did a radioactive caesium exist in earlier periods of the earth? Barium and strontium from pollucite. HAHN, O., STRASSMANN, F., MATTAUCH, J., AND EWALD, H. *Naturwissenschaften*, 30, *pp.* 541–542, *Sept.* 4, 1942. H. G. S.

1159 539.163.4

Tracer studies with radioactive hydrogen. The synthesis of labelled methyl iodide. HARMAN, D., STEWART, T. D., AND RUBEN, S. *J. Amer. Chem. Soc.*, 64, *pp.* 2293–2294, *Oct.*, 1942.

1160 539.163.4

A study of Menschutkin reaction using radioactive hydrogen as a tracer. HARMAN, D., STEWART, T. D., AND RUBEN, S. *J. Amer. Chem. Soc.*, 64, *pp.* 2294–2296, *Oct.*, 1942.

1161 539.163.4

Some exchange experiments with radioactive tracers. RUBEN, S., KAMEN, M. D., ALLEN, M. B., AND NAHINSKY, P. *J. Amer. Chem. Soc.*, 64, *pp.* 2297–2298, *Oct.*, 1942.

1162 539.163.4

Tracer studies with radioactive carbon. The synthesis and oxidation of several three carbon acids. NAHINSKY, P., RICE, C. N., RUBEN, S., AND KAMEN, M. D. *J. Amer. Chem. Soc.*, 64, *pp.* 2299–2302, *Oct.*, 1942.

1163 539.163.4

Use of deuterium as a tracer in the Claisen rearrangement. KISTIAKOWSKY, G. B., AND TICHENOR, R. L. *J. Amer. Chem. Soc.*, 64, *pp.* 2302–2304, *Oct.*, 1942.

1164 539.163.4 : 541.144.7

Tracer studies with radioactive hydrogen. Some experiments on photosynthesis and chlorophyll. NORRIS, T. H., RUBEN, S., AND ALLEN, M. B. *J. Amer. Chem. Soc.*, 64, *pp.* 3037–3040, *Dec.*, 1942.

1165 539.163.4 : 576 : 612

The use of radioactive tracers in biology and medicine. HAMILTON, J. G. *Radiology*, 39, *pp.* 541–572, *Nov.*, 1942.—In recent years, artificial radioactivity has been applied to investigate the metabolism of elements by living organisms—the radioactive isotope of a stable element being used to "trace" the action of the latter. The isotopes of 21 elements have been employed. The article describes the technique and some applications. A. E. T.

1166 539.165.2 = 3

On a supposed β-radiation of radium A and the natural existence of element 85. KARLIK, B., AND BERNERT, T. *Naturwissenschaften*, 30, *pp.* 685–686, *Oct.* 30, 1942. H. G. S.

1167 539.166

Gamma-rays from Sc^{48}. MANDEVILLE, C. E. *Phys. Rev.*, 62, *pp.* 555–556, *Dec.* 1 *and* 15, 1942.

1168 539.166

The angular correlation of successive gamma-rays. BERINGER, R. *Phys. Rev.*, 63, *pp.* 23–28, *Jan.* 1 *and* 15, 1943.—The angular dependence of γ–γ coincidences was studied for Na_{24}, Cl_{38} and Br_{82} in an attempt to evaluate the predicted angular correlations betw. successive quanta. The coincidence rates were found to be indep. of the rel. directions of the quanta except as the counters approached each other closely, where an increase was observed. This increase was attributed to scattered quanta and was measured by an indep. method.

1169 539.166.75

The photo-effect from hard γ-rays. DAVIDSON, Z. S., AND LATYSHEV, G. D. *J. Phys., U.S.S.R.*, 6, 1–2, *pp.* 15–25, 1942.—The photo-effect from the γ-line 2 620 ekV was investigated by a magnetic spectrograph with electron focusing and registration of electrons by 2 counters in coincidence. The abs. value of the effective cross-section for the photo-effect in Pb was measured. A relation was found betw. the probability of photo-electric absorption in the *k*- and *L*-shells of the atom. An estimate is made of the value of the angle of spreading of the electrons in the photo-effect.

1170 539.172.3 = 3

The γ-ray transition of the bromine isomer $Br_{80}^{4\cdot5h}$. KREBS, A. *Naturwissenschaften*, 30, *p.* 121, *Feb.* 20, 1942. H. G. S.

1171 539.172.4

Cyclotron targets: preparation and radiochemical separations. I. Arsenic and germanium. IRVINE, J. W., JR. *J. Phys. Chem.*, 46, *pp.* 910–914, *Nov.*, 1942.—Radioarsenic from the Ge(*d*,*n*)As reaction is prepared by cyclotron bombardment of a Ge-Cu alloy on a probe target. A separation of radioarsenic that yields high sp. activities with little dangerous handling is described. Radiogermanium is prepared free of As contamination and precipitated as the sulphide.

1172 539.185.9 : 621.384 = 3

On a system of ion sources with mass-monochromator for generators of neutrons. ARDENNE, M. VON. *Phys. Z.*, 42, 5–6, *pp.* 91–101, 1942.—[Abstr. 1086 B (1943)].

1173 539.211 : 621.317.39

An instrument for measuring surface roughness. GRAVLEY, C. K. *Electronics*, 15, *pp.* 70–73, *Nov.*, 1942.—[See Abstr. 1026 B (1943)].

1174 539.211 : 621.385.833

Fine structure of metallic surfaces with the electron microscope. HEIDENREICH, R. D., AND PECK, V. G. *J. Appl. Phys.*, 14, *pp.* 23–29, *Jan.*, 1943.—Techniques for producing surface replicas to be used in the transmission electron microscope are discussed. A 2-step process is described which utilizes moulded polystyrene as the first replica and evaporated silica as the second. A table is included of the amounts of silica required for several surfaces of different roughness to yield films of the same quality. Electron micrographs of replicas so prepared are exhibited illustr. pearlitic structures in a 0·98 C, hot-roll steel, precipitation in a Cu-Be alloy, and a calcite cleavage plane. A resolution of approx. 50 Å is demonstrated in the calcite cleavage plane.

1175 539.211 : 669 : 621.385.833 = 3

The electrostatic electron microscope and some results from the metallurgical field. MAHL, H. *Z. Metallk.*, 33, *pp.* 68–73, *Feb.*, 1941.—[Abstr. 1092 B (1943)].

1176 539.215.4 : 77

On size-frequency distribution in photographic emulsions. SILBERSTEIN, L. *J. Opt. Soc. Amer.*, 33, *pp.* 35–42, *Jan.*, 1943.

1177 539.23 : 541.68 : 679.5

Mechanical properties of cellulose acetate as related to molecular chain length. SOOKNE, A. M., AND HARRIS, M. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 1–14, *Jan.*, 1943.—The mech. properties of films prep. from a series of fractions of cellulose acetate, varying widely in mol. chain length, were determined. A close correlation was found betw. the results of folding endurance and ultimate elongation measurements.

1178 539.26

X-ray and optic measurements on β-lactoglobulin. FANKUCHEN, I. *J. Amer. Chem. Soc.*, 64, *pp.* 2504–2505, *Oct.*, 1942.

See Abstr. 1109 539.26 : 535.323 : 662.66 : 536.658.2

1179 539.26 : 541.18 = 3

Calculation of the size of colloidal particles from X-rays diffracted at the smallest angles. KRATKY, O. *Naturwissenschaften*, 30, *pp.* 542–543, *Sept.* 4, 1942.

H. G. S.

1180 539.26 : 541.6

Macromolecular disorder in linear polyamides. Relation of structure to physical properties of copolyamides. BAKER, W. O., AND FULLER, C. S. *J. Amer. Chem. Soc.*, 64, *pp.* 2399–2407, *Oct.*, 1942.—31 linear polyamides and copolyamides of varying crystal structures and conc. of polar linkages along the chains were studied as fibres and as polycrystalline sections by X-ray diffraction. The elastic mod. and moisture sorption were determined on typical samples. The series represents a range of solid polymers from soft to porcelain-like in properties, with several-fold variation in Young's modulus. The polar linkages which join the paraffin sections of the base units together in the long chains associate in adjacent macromolecules to form H-bonded dipole layers. This interaction is supposed to govern the physical properties of the solids. By this concept it was possible to interpret systematically the m.p., hardness, elastic mod. and moisture sorption in terms of the conc., separation, population and perfection of the dipole layers. Disorder introduced by copolymerization in which dipoles were shifted randomly along the chains altered the average dipole layer separations and also replaced polar groups in the layers by hydrocarbon chain sections. Such disorder caused softening of the solids and variation of X-ray identity periods along the chains with composition of the copolyamides. Macromolecular solids containing some crystalline regularity may be treated as defect systems in which rel. simple factors (position and organization of interacting polar groups) govern physical properties.

1181 539.26 : 669

The determination of equilibrium diagrams by X-ray methods. *J. Inst. Met.*, 69, *pp.* 1–27, *Jan.*, 1943.—A summary of a symposium, held under the chairmanship of W. L. Bragg. Four main contributions are summarized: The determination of phase boundaries in equilibrium diagrams by X-ray methods, Owen, E. A.; The application of X-ray methods to the determination of phase boundaries in metallurgical equilibrium diagrams, Hume-Rothery, W.; The examination of heat-treated alloys by X-rays and the microscope, Bradley, A. J.; The metallurgist's point of view, Gayler, M. L. V. Typical successes and failures of the X-ray and classical methods are described. The contributors generally agree that, owing to the fact that each method is, in general, suited to the study of different types of specimen, and will therefore stress different aspects of the problem, or even yield apparently contradictory data, it is desirable to combine the 2 methods wherever possible.

J. T.

ELASTICITY. STRENGTH

1182 539.31 : 530.145

On dislocation theory and the physical changes produced by plastic deformation. KOEHLER, J. S. *Amer. J. Phys.*, 10, *pp.* 275–285, *Dec.*, 1942.—In quantum-mechanical calculations of the elastic constants of solids it is assumed that applied stress slightly displaces the atoms of a crystal from their equilibrium positions, and plastic deformation is associated with crystalline imperfection. Several physical changes are discussed which take place in a solid severely deformed at temperatures at which resoftening does not take place. Under hardness, Taylor's ideas are used to obtain the theoretical stress/strain curve. A calculation is made of the strain energy associated with the many dislocations that appear in a highly worked metal. The average magnetization value is expressed in terms of the density of dislocation pairs. The density and elast. const. of a metal decrease slightly as an effect of cold-working, but the calculated reductions in the elast. const. are too small. The calculated change in the electrical resistance of a severely cold-worked metal is smaller than the exp. value by a factor of 10 or more; the change in resistance is not due to the presence of dislocations.

G. E. A.

1183 539.31 : 620.1

Experimental determination of the isostatic lines. DURELLI, A. J. *J. Appl. Mech.*, 9, *A*155–*A*160, *Dec.*, 1942.—The technique consists in covering the surface of the body with a thin coat of lacquer which becomes brittle upon hardening. If the object being tested is painted under zero load and then stressed after the coating has hardened, the layer of lacquer will crack along lines perpendicular to the max. tensile strain. The companion set of trajectories at rt. angles can be formed through relaxation.

1184 539.31 : 620.1

Brittle coatings for quantitative strain measurements. FOREST, A. V. DE, ELLIS, G., AND STERN, F. B., JR. *J. Appl. Mech.*, 9, *A*184–*A*188, *Dec.*, 1942.—Ref. is made to the "Stresscoat" materials and method which can effect quantitative analyses within the elastic range by use of brittle coatings alone. In the plastic range, the flaking off of the coating is caused by a compression component of strain of about 1%. Graphs and illustrations show the effect of coat thickness, time of dry, temperature and humidity, creep, and bubbles in the coating. Test procedure is outlined. Application of the method to a part from a high-speed sewing machine shows stress values and correlation of results with fatigue failures. Another application illustrated is a plate, penetrated by a bullet.

See Abstr. 1073 539.31 : 620.1 : 535.514

1185 539.32 : 669.14

The influence of temperature on the modulus of elasticity of some plain carbon and alloy steels. SEAGER, G. C., AND THOMPSON, F. C. *J. Iron Steel Inst.*, [17 *pp.*], 1943. *Advance copy.*—The variation of Young's modulus with temperature was measured for a series of steels, plain carbon and alloyed, using an interferometer of high sensitivity. The curves have abnormalities which exceed the exp. error.

1186 539.383: 621.822 = 3

Addendum to the paper: The penetration of a roll in a plane bearing. HERMANN, H. *Phys. Z.*, 43, 3–4, 69, 1942.—Ref. to eq. (2) [Abstr. 257 (1943)].

H. G. S.

1187 539.387

Measuring the degree of curl of paper. CARSON, T., AND WORTHINGTON, V. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 113–121, *Feb.*, 1943.—The max. curvature of freely curling paper is determined from measurements made of the paper in contact with water; the apparatus is described. Measurements were made of the rel. curliness of lithographic papers. The correlation with other properties is discussed.

1188 539.389.1

Beyond the yield point. DALEY, F. S. *J. Instn Engrs, Aust.*, 14, *pp.* 225–232, *Oct.*, 1942.—A brief summary is given of the behaviour of metals in the region above the yield point, with sp. ref. to work-hardening and stress concentration due to cross-sectional variations. The creep of metals at elevated temperatures is mentioned, together with the phenomenon of precipitation-hardening. The application of plastic working to manufacturing processes is described, including the deep-drawing of automobile panels, cartridge cases, etc. A. C. W.

1189 539.4.014 : 531.224.4

Perforated cover plates for steel columns: compressive properties of plates having ovaloid perforations and a width-to-thickness ratio of 53. STANG, A. H., AND GREENSPAN, M. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 15–39, *Jan.*, 1943.—Tests were made to determine the mech. properties of perforated cover plates intended to be used as a substitute for lattice bars or batten plates in built-up box-type columns. Each test column was built up from 1 perforated plate and either 2 or 4 angles. Columns with unperforated plates were used as controls.

1190 539.4.016.3 : 535.81

Note on the annealing of glass. WEYL, W. A., AND PINCUS, A. G. *J. Appl. Phys.*, 14, *pp.* 37–39, *Jan.*, 1943.—The rate of removal of mech. strain for glasses is $\propto$ (birefringence)^2. The paper explains this in terms of the structural picture of glass. During annealing the stress optical const. of the glass, as well as its viscosity, undergoes a continuous change.

1191 539.43 : 620.178 : 669.144

Strength of steel subjected to biaxial fatigue stresses. MARIN, J. *Weld J., pp.* 554–559, *Nov.*, 1942.—The strength is probably not influenced by the presence of a biaxial state of equal stresses. The biaxial stresses, both of which were tensile, were obtained by subjecting a thin-walled tubular specimen to a fluctuating internal pressure synchronized with a fluctuating axial load. A description is given of the machine built to apply these stresses and tests on various steels are reported. M.-V.

1192 539.43 : 629.13 : 621.791 : 621.367

Fatigue strength of welded aircraft joints. BUCKWALTER, T. V., AND HORGER, O. J. *Weld. J., pp.* 525–539, *Nov.*, 1942.—[Abstr. 1078 B (1943)].

1193 539.434

Report on tubular creep tests. NORTON, F. H., AND SODERBERG, C. R. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 769–777, *Nov.*, 1942.—Test results on tubular specimens under internal pressure as measured for circumferential and longitudinal creep. [See Abstr. 550, 551 (1942)].

1194 539.531 : 539.016.3 : 620.1

How to use hardness tests. GRAY, T. H. *Machinist, pp.* 1075–1078, *Jan.* 16, 1943.—Hardness after quenching is a criterion of the heat treatment of steel. A low value of hardness may be due to decarburization, excessive or low hardening temperatures, insufficient hardening time or the failure of the quenching bath to cool the steel at a rate faster than its critical cooling rate. Methods for determining which of these factors is the cause of a low hardness value are given. Hardness measurements are also useful as a means of tempering control, in the study of case depth and in the determination of composition, tensile strength, machinability and ductility. M.-V.

1195 539.62 : 621.89 : 621.95

Correlation of coefficient of friction with drilling torque and thrust for different types of cutting fluids. SCHMIDT, A. O., GILBERT, W. W., AND BOSTON, O. W. *Trans. Amer. Soc. Mech. Engrs*, 64, *pp.* 703–707; *Disc.*, 707–709, *Oct.*, 1942.—[Abstr. 901 B (1943)].

1196 539.621

Metallic friction: theory. BOWDEN, F. P., AND TABOR, D. *Bull. Counc. Sci. Industr. Res. Aust., No.* 145, [59 *pp.*], 1942. *Abstr. in J. Text. Inst. Manchr*, 33, p. *A*601, *Dec.*, 1942.—The theory that frictional resistance can be covered by two terms, the more important one being the shearing of the metallic junctions formed at points of contact, the other the work of dragging the surface irregularities of the harder through the softer metal, is developed. It has been tested for steel sliding on indium with satisfactory results. Frictional properties of thin films of In, Pb and Cu deposited on other metals have been investigated. The results conform with the theory.

E. R. A.

PHYSICAL CHEMISTRY

See Abstr. 992 541.088 : 519.25

See Abstr. 1100 541.12.013 : 536.655 : 539.155.2 : 536.423.15

1197 541.121 : 536.7 : 669.018 = 3

The equilibrium diagram of the alloys at low temperatures. MASING, G. *Naturwissenschaften*, 30, *pp.* 157–161, *March* 13, 1942.—The diagram represents only the most stable lim. condition towards which the states generally tend by passing through thermodynamically unstable intermediate stages. H. G. S.

1198 541.123.3

The system ethyl-alcohol–glycerol–carbon-tetrachloride at 25°C. MCDONALD, H. J., KLUENDER, A. F., AND LANE, R. W. *J. Phys. Chem.*, 46, *pp.* 946–948, *Nov.*, 1942.—The solubility relationships, region of immiscibility, and tie lines for the ternary system ethyl-alcohol–glycerol–carbon-tetrachloride were determined at 25·0°C. A viscosimetric method was used to analyse the composition of the conjugate solutions.

See Abstr. 1035 541.123.31 : 532.739.2

1199 541.124

The acid-catalysed hydrolysis of phenyl-substituted aliphatic esters. SMITH, H. A., AND MYERS, R. R. *J. Amer. Chem. Soc.*, 64, *pp.* 2362–2365, *Oct.*, 1942.—

The introduction of a phenyl group into an aliphatic ester results in a decrease in reaction rate for all esters studied, even though the phenyl group acts as an electron sink, and should cause an increase in the rate of hydrolysis. The results may be explained on the assumption that the steric effect of the phenyl group outweighs its inductive effect. A comparison is made of the effect of phenyl substitution on acid hydrolysis, saponification and esterification.

1200 541.124 : 669 = 3

The sintering processes in powders consisting of a single component.—A contribution for elucidating the processes of metal ceramics and oxide ceramics. 3rd comprehensive communication on the course of chemical processes in which solid substances are concerned. HÜTTIG, G. F. *Kolloid Z.*, 97, *pp.* 281–300, *Dec.*, 1941.—After defining the sintering processes and assigning them their place within the scheme [Abstr. 2419 (1942)], the energy relations are discussed from the point of view of thermochemistry and chemical thermodynamics. As a final state of equilibrium a definite deg. of dispersity corresp. to each temperature. Bibliography. R. N.

1201 541.127

The study of a steric factor in the permanganate oxidation of triolein monolayers. MITTELMANN, R., AND PALMER, R. C. *Trans. Faraday Soc.*, 38, *pp.* 506–513, *Nov.–Dec.*, 1942.—The pressure dependence of the reaction velocity of monolayers of triolein spread on 0·0025*N*–$KMnO_4$, of *p*H = 1, follows a first-order law betw. 1 and 14 dynes/cm., is a linear function of the $KMnO_4$ conc., and increases with decreasing *p*H of the substrate. A simple model is described from which the force-area curve and equation are derived. Results agree with experiment. N. M. B.

1202 541.127

Absorption of oxygen by glutathione in alkaline solutions. I. Kinetics of the reaction at *p*H 9 to 11. YOUNG, M. B., AND YOUNG, H. A. *J. Amer. Chem. Soc.*, 64, *pp.* 2282–2287, *Oct.*, 1942.—The rate of absorption of O_2 by glutathione in the *p*H range 9 to 11 and in the presence of $CuSO_4$ catalyst was measured. The effect of changes in $CuSO_4$ and glutathione conc. and O pressure are presented. A rate law and partial mechanism are proposed.

1203 541.127

Kinetics and equilibria of the carbinol formation of phenolphthalein. BARNES, M. D., AND LAMER, V. K. *J. Amer. Chem. Soc.*, 64, *pp.* 2312–2316, *Oct.*, 1942.—The kinetics of the reaction of phenolphthalein with hydroxyl ion to produce a colourless carbinol have been investigated spectrophotometrically at 25° for NaOH solutions (0·006 to 0·020 *M*) with and without the addition of NaCl. The extinction coeff. is indep. of the conc. of alkali.

1204 541.127

The rates of reaction of diacetone glucose, diacetone galactose and diacetone sorbose with *p*-toluenesulphonyl chloride in pyridine solution. HOCKETT, R. C., AND DOWNING, M. L. *J. Amer. Chem. Soc.*, 64, *pp.* 2463–2464, *Oct.*, 1942.

1205 541.127

Reactions in solutions containing O_3, H_2O_2, H^+ and Br^-. The specific rate of the reaction $O_3 + Br^- \rightarrow$. TAUBE, H. *J. Amer. Chem. Soc.*, 64, *pp.* 2468–2474, *Oct.*, 1942.

See Abstr. 1235 541.127 : 548.55 : 541.183.56

1206 541.128

The catalytic properties of charcoal. IV. Factors influencing the indophenol reaction. SCHWOB, C. WITH BIEGNER, J. E., CARSON, K. J., AND SCOTT, G. V. *J. Amer. Chem. Soc.*, 64, *pp.* 2276–2279, *Oct.*, 1942.—The oxidation of α-naphthol and *p*-phenylenediamine in the presence of activated charcoal appears to involve several simultaneous and successive processes. The measurement of the indophenol production is not an adequate test of the charcoal activity.

1207 541.128

Catalysts for peroxide decomposition. BOBTELSKY, M., AND SIMCHEN, A. E. *J. Amer. Chem. Soc.*, 64, *pp.* 2492–2498, *Oct.*, 1942.

1208 541.128

The catalytic effect of electrolytes on solvolytic reactions. AUDRIETH, L. F., SCOTT, L. D., AND HILL, O. F. *J. Amer. Chem. Soc.*, 64, *pp.* 2498–2499, *Oct.*, 1942.

See Abstr. 1136 541.128 : 538.22

1209 541.128.1

Catalytic activity of intermetallic compounds in the vapour-phase reduction of nitrobenzene. II. BERK, B., AND BROWN, O. W. *J. Phys. Chem.*, 46, *pp.* 964–968, *Nov.*, 1942.—Cu on ZnO catalyst exhibits the same general properties as a pure Cu catalyst. The Cu_3Sn catalyst has the properties of both metals. Heating the Cu_3Sn catalyst in H for 2 hr. at 360°C decreases the activity more than 60%. The temperature of max. activity for the Cu_3Sb catalyst is higher than that of either of the constituent metals.

1210 541.128.1

Catalytic hydrogenation of cystine. KAVANAGH, K. E. *J. Amer. Chem. Soc.*, 64, *p.* 2721, *Nov.*, 1942.

1211 541.128.1

The catalytic reduction of cholesterol α-oxide. STAVELY, H. E. *J. Amer. Chem. Soc.*, 64, *pp.* 2723–2724, *Nov.*, 1942.

1212 541.132

Revised constants for the Debye–Hückel theory. STONEHILL, H. I., AND BERRY, M. A. *J. Amer. Chem. Soc.*, 64, *pp.* 2724–2725, *Nov.*, 1942.

1213 541.132 : 535.375.5

Effect of temperature on the dissociation of strong electrolytes by Raman effect. RAO, N. R. *Curr. Sci.*, 11, *pp.* 429–430, *Nov.*, 1942.—[See Abstr. 288 (1943)].

See Abstr. 1216 541.132 : 536.66 : 536.75 : 536.77 : 541.134

1214 541.133

The temperature coefficient of the conductance of potassium chloride solutions. GORDON, A. R. *J. Amer. Chem. Soc.*, 64, *p.* 2517, *Oct.*, 1942.—[See Abstr. 2918 (1942)].

1215 541.134

The effect of centrifugal fields on the electromotive force of galvanic cells. MACINNES, D. A. *Ann. N.Y. Acad. Sci.*, 43, 5, *pp.* 243–251, 1942.—[See Abstr. 2435 (1942)]. Apparatus and experimental technique are described in detail. The small potentials developed (of the order of 1 mV) are best studied by the centri-

age method which requires only 1 type of reversible electrode, which need not carry appreciable current.

H. H. HO.

1216 541.134 : 541.132 : 536.66 : 536.75 : 536.77

pH values of certain phosphate-chloride mixtures, and the second dissociation const. of phosphoric acid from 0° to 60°C. BATES, R. G., AND ACREE, S. F. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 129–155, *Feb.*, 1943.—Measurements of the e.m.f. of galvanic cells composed of H and Ag-AgCl electrodes in aq. chloride-phosphate solutions were made from 0° to 60°C. Three ratios of the molalities of 2 phosphate salts were employed, and a wide range of conc. was covered. The second dissociation const. was evaluated from the exp. data. For each temperature, the heat and entropy of dissociation, the change of heat capacity, and the free-energy change accompanying the dissociation of 1 mole of $H_2PO_4^-$ were computed from the variation of the second dissociation constant with temperature. The *p*H value of each solution was calculated.

1217 541.134 = 3

On the effect of the temperature on the voltage of gas electrode chains in the measurement of *p*H. WENGEL, E., AND SCHRODT, N. *Naturwissenschaften*, 30, *pp.* 567–568, *Sept.* 11, 1942. H. G. S.

1218 541.135 : 621.317.755

The cathode-ray oscillograph in polarography. JONES, T. S. G. *Electronic Engng*, 15, *pp.* 367–371, *Feb.*, 1943.—[Abstr. 1033 B (1943)].

1219 541.135.5

The salt error of the quinhydrone electrode in aqueous nitric acid, and the potentials of the hydro-quinhydrone and quino-quinhydrone electrodes. STONEHILL, H. I. *Trans. Faraday Soc.*, 39, *pp.* 67–72, *Feb.–March*, 1943.—By e.m.f. measurements of cells involving the hydro-quinhydrone and quino-quinhydrone electrode at 25°C. in aq. HNO_3 solutions of conc. 0·05–1·0*N* was determined; the salt error is ∝ acid conc. The additivity of salt errors in mixed solutions of HCl and KNO_3 is demonstrated. The std. potentials of the hydro-quinhydrone and quino-quinhydrone electrodes at 25°C. are 0·6141 and 0·7459 V, respectively.

1220 541.136.1 : 536.7

On the theory of galvanic cells subject to fields of force. II. The electric and the magnetic field. KOENIG, F. O., AND GRINNELL, S. W. *J. Phys. Chem.*, 46, *pp.* 980–1005, *Nov.*, 1942.—An exact analysis is given of the thermodynamics of galvanic cells subject to stationary electric or magnetic fields. The case of the electric field is simple. For the magnetic field the analysis starts from the general thermodynamic equations for fluids in equilibrium in the magnetic field. These equations, combined with the assumption of quasi-reversible conduction, lead to a condition of the same form as that previously established [Abstr. 1613 (1940)]. This condition, combined with the condition for electrochem. equilibrium at an electrode, leads to general equations for the e.m.f. in the magnetic case. From these equations the laws for special types of cell are deduced. The effects of the magnetic field on e.m.f. are large enough for measurement only in the case of a ferromagnetic electrode in the form of a thin wire parallel to the field.

1221 541.138

The thallous-thallic redox potential in nitric and perchloric acids. STONEHILL, H. I. *Trans. Faraday Soc.*, 39, *pp.* 72–79, *Feb.–March*, 1943.—The formal thallous-thallic redox potential has been determined at 25°C. in perchloric and nitric acids at conc. 1·0–0·1 mol./l. by methods which eliminate liquid-junction potentials. Thallic salt hydrolysis and the necessary use of low Tl conc. to minimize liquid-junction potentials render the measurements increasingly unreliable at acid conc. $< 0·2$ mol./l. Assuming the applicability of the Hückel modification of the Debye–Hückel equation for single-ion activity coeff., it is estimated that the true std. redox potential is 1·280 V in both perchloric and nitric acids but lower in H_2SO_4.

1222 541.138.3

The reduction of unsaturated hydrocarbons at the dropping-mercury electrode. II. Aromatic polynuclear hydrocarbons. WAWZONEK, S., AND LAITINEN, H. A. *J. Amer. Chem. Soc.*, 64, *pp.* 2365–2368, *Oct.*, 1942.—[See Abstr. 296 (1943)]. The compounds gave ½-wave potentials indep. of their conc. and characteristic of certain structures. The diffusion current was ∝ the hydrocarbon conc.

1223 541.141

Attempt to detect free hydroxyl as an intermediate in photochemical reactions. BLAEDEL, W. J., OGG, R. A., JR., AND LEIGHTON, P. A. *J. Amer. Chem. Soc.*, 64, *pp.* 2499–2500, *Oct.*, 1942.

1224 541.141

Photo-oxidation of methyl iodide. BLAEDEL, W. J., OGG, R. A., JR., AND LEIGHTON, P. A. *J. Amer. Chem. Soc.*, 64, *pp.* 2500–2501, *Oct.*, 1942.

1225 541.141 : 676

Photochemical stability of papers. LAUNER, H. F., AND WILSON, W. K. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 55–74, *Jan.*, 1943.—Papers were irradiated with a carbon arc through a filter that completely eliminated infra-red, and ultra-violet shorter than 330 mμ. Sheet temperature was kept near 30°C. during irradiation, through contact with a thermostated metal backing. Yellowing of papers (without lignin) was found to result from heat or age, but not light; papers bleached when heat effects were eliminated during irradiation. Paper scorched brown at high temperatures or yellowed at 100°C., and yellow papers 250 years old, were bleached by light. Lack of oxygen inhibits but does not prevent photochemical deterioration.

1226 541.144.7

Photochemical studies. XXXV. The photochemical decomposition of *n*-butyl methyl ketone. DAVIS, W., JR., AND NOYES, W. A., JR. *J. Amer. Chem. Soc.*, 64, *pp.* 2676–2678, *Nov.*, 1942.—The decomposition of *n*-butyl methyl ketone at 23°–28° at pressures 5–13 mm. yields mainly compounds having the empirical formula C_3H_6 and C_3H_6O. This is true for unfiltered radiation of the Hg arc and for approx. monochromatic 3 130 Å radiation. Small amounts of CO are produced. In no case was more than a few per cent. of the parent ketone decomposed.

See Abstr. 1164 541.144.7 : 539.163.4

1227 541.18 : 53

Some physical chemical characteristics of glycogen. BRIDGMAN, W. B. *J. Amer. Chem. Soc.*, 64, *pp.* 2349–2355, *Oct.*, 1942.—Glycogen solutions prep. by the acidic or the basic method give an inhomogeneous product. The bulk of the material lies in the range of sedimentation const. from 20 to 120 *S* with the max. component of $s_{20} = 70\,S$. This max. corresponds to a mol. wt. of 2 000 000 if the particle is spherical, or of 4 000 000 if the diffusion const. can be used to evaluate the frictional resistance to sedimentation.

See Abstr. 1179 541.18 : 539.26 = 3

1228 541.18.025

Reversible aggregations of colloidal particles. III. Isothermal reversible sol syneresis. HELLER, W. *J. Phys. Chem.*, 46, *pp.* 783–793, *Oct.*, 1942.—A thixotropic gel changes into a reversibly syneretic system if its colloid conc. is reduced below a lim. value which may vary with the dia. of the container. The deg. of syneretic separation into a conc. and a dilute phase is a linear function of the colloid conc. The significance of a critical conc. is discussed. The influence of the electrolyte conc. and of centrifuging is investigated.

1229 541.18.03

The ultracentrifuge. *Ann. N.Y. Acad. Sci.*, 43, 5, *pp.* 175–251, 1942.—A symposium comprising the following papers: Introduction to the conference on the ultracentrifuge. MacInnes, D. A. [Abstr. 1230 (1943)]; The production and maintenance of high centrifugal fields for use in biology and medicine. Beams, J. W. [Abstr. 1231 (1943)]; Optical problems of the ultracentrifuge. Bridgman, W. B., and Williams, J. W. [Abstr. 1071 (1943)]; The integration of the differential equation of the ultracentrifuge. Archibald, W. J. [Abstr. 989 (1943)]; The present status of molecular weights of proteins. Rothen, A. [Abstr. 1237 (1943)]; The effect of centrifugal fields on the electromotive force of galvanic cells. MacInnes, D. A. [Abstr. 1215 (1943)].

1230 541.18.03

Introduction to the conference on the ultracentrifuge. MACINNES, D. A. *Ann. N.Y. Acad. Sci.*, 43, 5, *pp.* 175–176, 1942.—The conference was arranged with two main objectives: (1) To ascertain whether the theoretical developments of Archibald [See Abstr. 989 (1943)] could be put to practical use; (2) To discuss the adoption of 0°C. as the std. temperature for the measurement of the physical properties of proteins and solutions of proteins. If values of sedimentation const., viscosity, diffusion const., etc., were obtained at that temperature, it would eliminate the present necessity of considering temperature coeff. The conference decided to adopt, as a convenient practical unit for sedimentation const., the "Svedberg," denoted by *S* and $= 10^{-13}$ times the abs. units. H. H. HO.

1231 541.18.03 : 621.34

The production and maintenance of high centrifugal fields for use in biology and medicine. BEAMS, J. W. *Ann. N.Y. Acad. Sci.*, 43, 5, *pp.* 177–193, 1942.—Recent work in the production and maintenance of high centrifugal fields is reviewed, and the following designs of centrifuge are considered in detail: Svedberg gas-driven, vacuum-type of air-driven, and electrically driven and magnetically supported vacuum-type. It is shown that there are methods of spinning rotors to their bursting points under controllable conditions, and that the centrifugal fields may be produced without remixing of the material.

H. H. HO.

1232 541.182.5

Theory of molecular-size distribution and gel formation in branched-chain polymers. STOCKMAYER, W. H. *J. Chem. Phys.*, 11, *pp.* 45–55, *Feb.*, 1943.—An extension of previous work [Abstr. 1655, 2189 (1942)] which showed that very large polymeric molecules appear suddenly at a critical extent of reaction, predicted to occur at the exp. obs. gel point. This transition is analogous to the condensation of a saturated vapour.

See Abstr. 1028 541.183.25 : 532.613.2

See Abstr. 1108 541.183.55 : 532.696 : 536.658

1233 541.183.56

The adsorption of gases at low temperature and pressure on smooth silver. ARMBRUSTER, M. H. *J. Amer. Chem. Soc.*, 64, *pp.* 2545–2553, *Nov.*, 1942.—The adsorption of H_2, N, A, CO, CO_2 and O_2, at pressures up to 0·1 cm. on a plane, reduced surface of Ag has been measured at $-195°$ to 20°. All the isotherms are of the type observed in a plane surface of other metals, and are repr. by the Langmuir equation. Force/area curves are derived by 2 methods, with results which differ significantly.

1234 541.183.56

The sorption of carbon monoxide by metals. Temperature variation experiments. GRIFFIN, C. W. *J. Amer. Chem. Soc.*, 64, *pp.* 2610–2613, *Nov.*, 1942.—The presence of a secondary sorptive force is a characteristic of metallic sorbents. This factor (solution) manifests itself to a small extent with supported sorbents where the metal is largely exposed as surface. With massive metals and CO the secondary action is over 3 times as great in Pt, and about 10 times as great in Cu, when compared with their respective supported forms.

1235 541.183.56 : 548.55 : 541.127

Reaction of gases on the surface of a single crystal of copper. I. Oxygen. GWATHMEY, A. T., AND BENTON, A. F. *J. Phys. Chem.*, 46, *pp.* 969–980, *Nov.*, 1942.—The rate of reaction with O_2 varies with the crystal plane along which the surface is prepared by electrolytic polishing followed by annealing in H_2 at 550°. The rel. rates of oxidation in air at 200° for the various crystal planes are given. At 500° there is some change in this order of rates, and there are slight changes when the surface, after electrolytic polishing, is treated with various reagents to give varying degrees of roughness prior to oxidation. A qualitative interpretation of results in terms of simple concepts is given. N. M. B.

1236 541.2 = 3

On the periodic system of the elements. KIPP, F. *Naturwissenschaften*, 30, *pp.* 679–683, *Oct.* 30, 1942.—After a brief discussion of the periodic table and ref. to a simple spiral arrangement of the elements details are given of a lemniscate grouping which gives an adequate representation of the periodic properties.

he disposition of the elements in the 8-shaped spirals clearly shown in the diagram. H. G. S.

1237 541.24

The present status of molecular weights of proteins. OTHEN, A. *Ann. N.Y. Acad. Sci.*, 43, 5, *pp.* 229–41, 1942.—The paper discusses the method, surveys he accumulated data, and indicates in which direc- on progress lies. The limitations of the method are xamined, and possible improvements in technique iscussed. These limitations include uncertainties in he measurements of sp. vol., the distribution of the articles by the equilibrium method, and the shape actor (data obtained with the centrifuge do not permit ifferentiation betw. oblong and oblate types).

H. H. HO.

1238 541.25

Partial molal volumes of nickel sulphate solutions. ELBACH, R. W., AND LOUDERBACK, H. M. *J. Amer. Chem. Soc.*, 64, *p.* 2379, *Oct.*, 1942.—Densities at 5° of $NiSO_4$ solutions from 0·0634 molar to 2·525 olar (saturated) have been determined. The olubility was 28·42 g./100 g. of solution. $NiSO_4$ onforms to the lim. equation as developed from Debye–Hückel theory.

1239 541.454

Basicity studies of tertiary vinyl amines. ADAMS, R., ND MAHAN, J. E. *J. Amer. Chem. Soc.*, 64, *pp.* 2588–593, *Nov.*, 1942.—The vinyl tertiary amines are more asic than the corresp. saturated compounds. This s explained by assuming hydration and rearrangement o a quaternary NA_3 base.

1240 541.5

Bond energy, bond distance, and the nature of the covalent linkage. BURAWOY, A. *Trans. Faraday Soc.*, 39, *pp.* 79–90, *Feb.–March*, 1943.—There is a distinction betw. the ideal ionic linkage and the covalent linkage which can possess a polar character. An analysis of the observed bond energies and bond distances of covalent linkages indicates that their stability will be due to (i) the fundamental covalent forces; (ii) ionic, i.e. Coulomb forces; (iii) other forces, e.g. those connected with the deformation of the electrons and nuclei. The actual state of these linkages cannot be described in terms of ideal classical structures.

See Abstr. 1111 541.552 : 536.662

See Abstr. 1144 541.57 : 539.13

See Abstr. 1146 541.57 : 539.133

1241 541.6

Additive physical properties in hydrocarbon mixtures. DEANESLY, R. M., AND CARLETON, L. T. *J. Phys. Chem.*, 46, *pp.* 859–870, *Nov.*, 1942.—The additivity of a mol. physical property of a hydrocarbon mixture is defined; a general equation rel. the simple property to H content, mol. wt. and unsaturation is derived. The equation is applied to sp. vol. and to sp. refraction.

See Abstr. 1180 541.6 : 539.26

1242 541.63 : 535.563

Studies in stereochemistry. III. The preparation of *d*-1-deutero-2-methylbutane and the study of its optical rotation. BROWN, H. C., AND GROOT, C. *J. Amer. Chem. Soc.*, 64, *pp.* 2563–2566, *Nov.*, 1942.—*d*-1-deutero-2-methylbutane was prepared from *d*-2-methylbutanol-1 and examined in a sensitive polarimeter. The optical activity of the pure hydrocarbon in a 1 dm. tube is $< 0{\cdot}005°$ and probably $< 0{\cdot}002°$.

1243 541.636

Studies in stereochemistry. II. Steric strains as a factor in the relative stability of some etherates of boron fluoride. BROWN, H. C., AND ADAMS, R. M. *J. Amer. Chem. Soc.*, 64, *pp.* 2557–2563, *Nov.*, 1942.—The BF addition compounds with methyl ether, ethyl ether, isopropyl ether and tetrahydrofuran, have been prepared and characterized. The dissociation was studied over a range of temperatures, and ΔH, ΔF and ΔS for the reaction were obtained. [See Abstr. 1946 (1942)].

1244 541.636

Mechanism of the reaction between hindered carbonyl compounds and the Grignard reagent. II. ARNOLD, R. T., and LIGGETT, R. W. *J. Amer. Chem. Soc.*, 64, *pp.* 2875–2877, *Dec.*, 1942.—A number of allyl esters were prepared which have varying degrees of steric hindrance about the carbonyl group. The magnitude of these steric factors determines whether the allyl esters are cleaved by the Grignard reagent or undergo the well-known reaction to produce tertiary alcohols.

1245 541.64

The structure of copolymers of vinyl chloride and vinyl acetate. MARVEL, C. S., JONES, G. D., MASTIN, T. W., AND SCHERTZ, G. L. *J. Amer. Chem. Soc.*, 64, *pp.* 2356–2362, *Oct.*, 1942.—Vinyl chloride and vinyl acetate copolymerize to produce polymer chains containing both units. However, the polymer molecules produced in a given case differ in composition and the first chains produced are richer in vinyl chloride than is the monomer mixture from which they are formed. The copolymers made by complete polymerization of a given starting mixture of monomer vary in composition from chain to chain.

1246 541.64

The polymerization of styrene catalysed by *p*-bromobenzenediazonium hydroxide. PRICE, C. C., AND DURHAM, D. A. *J. Amer. Chem. Soc.*, 64, *pp.* 2508–2509, *Oct.*, 1942.

See Abstr. 1075 541.653 : 535.563

1247 541.653.4

The malonic ester synthesis and Walden inversion. GRIGSBY, W. E., HIND, J., CHANLEY, J., AND WESTHEIMER, F. H. *J. Amer. Chem. Soc.*, 64, *pp.* 2606–2610, *Nov.*, 1942.—A stereochemical study of the reaction of Na malonic ester with cyclopentene oxide in the presence of excess malonic ester shows that the reaction involves Walden inversion about one of the C atoms of the oxide ring.

See Abstr. 1098 541.66 : 536.421.4

See Abstr. 1099 541.66 : 536.423.1

1248 541.67 : 537.226 : 621.315.616.96

Electrical properties of solids. XIII. Polymethyl acrylate, polymethyl methacrylate, polymethyl-α-chloracrylate and polychloroethyl methacrylate. MEAD, D. J., AND FUOSS, R. M. *J. Amer. Chem. Soc.*, 64, *pp.* 2389–2393, *Oct.*, 1942.—[See Abstr. 1956 (1942)]. The dielectric constants and loss factors of polymethyl acrylate, polymethyl methacrylate (alone and plasticized with 20 and 30% diphenylmethane), polymethyl α-chloracrylate and polychloroethyl methacrylate at

— 70° to + 100° and from 60 to 8 000 c./s. have been determined. The preparation of chloroethyl methacrylate (b.p. 170°) is described. Some preliminary results on a correlation betw. structure and electrical properties for polymers of the type $(—CH_2 . CXY—)_n$ are given.

See Abstr. 1036 541.68 : 532.13 : 532.77

See Abstr. 1177 541.68 : 679.5 : 539.23

See Abstr. 1061 544 : 535.371

See Abstr. 1021 546.23 : [536.421.1 + 531.75

CRYSTALLOGRAPHY

See Abstr. 1143 548 : 538.662.13

1249 548.2 : 669.14 = 3

The orientation of Fe_3C crystals in annealed steel. ARBUSOW, M., AND KURDJUMOW, G. *J. Phys., U.S.S.R.*, 6, 3–4, *pp.* 163–166, 1942.—The orientation of the Fe_3C formed in annealed steel when martensite and austenite decompose is determined from rotation photographs of a single-crystal specimen of annealed carbon steel. It is found that the [100] direction of Fe_3C is parallel to the $[45\bar{5}]$ of austenite, the [010] to the [011] and the $[00\bar{1}]$ to the $[\bar{5}22]$. J. T.

1250 548.33

The polymorphism of calcium carbide. BREDIG, M. A. *J. Phys. Chem.*, 46, *pp.* 801–819, *Oct.*, 1942.—The thermal conditions of stability of crystal modifications of CaC_2, prep. in the electric arc furnace, were established through the application of mech. deformation and by use of the high-temperature X-ray camera. The polymorphism of the alkaline-earth metal carbides is summarized. The influence of CaS, $CaCN_2$ and Ca metal upon the course of the transformations are discussed.

1251 548.5 : 669.22 : 621.357.7

The adherence of thick silver plate on steel. II. CROSBY, H. L., AND GILBERTSON, L. I. *Trans. Electrochem. Soc., Prepr. No.* 20, 1942.—[Abstr. 802 B (1943)].

See Abstr. 1235 548.55 : 541.127 : 541.183.56

1252 548.55 = 3

Observations on melting monocrystalline wires of tungsten. STRANSKI, I. N., AND SCHUMANN, R. *Naturwissenschaften*, 30, *p.* 662, *Oct.* 23, 1942. H. G. S.

1253 548.73

Determination of the space groups of the crystals of diphenyl-benzamide and anisic acid. ROKADE, R. K., KHABARIA, R. H., AND KAPADIA, M. R. *J. Univ. Bombay*, 11, *pp.* 37–44, *Nov.*, 1942.—Crystals of diphenyl-benzamide and anisic acid were studied by the rotating-crystal method. The dimensions of the unit cell, the number of molecules in the cell and the space groups to which the crystals belong are determined.

1254 548.73 = 3

Crystal orientation in tarnishing layers. SCHWAB, G. M. *Z. phys. Chem. B*, 51, *pp.* 245–264, *June*, 1942.—Debye–Scherrer diagrams were taken of layers formed on Ag, Cu, Pb and some Ag-halogenides by various tarnishing reactions. With some of the substances investigated an influence of the crystallographic directions of the basic material on the lattice orientation of the tarnishing layer was found. The conditions necessary for this oriented structure of the layer are tentatively stated. R. N.

GEOPHYSICS

1255 550.3

Summary of the year's work, to June 30, 1942. Department of Terrestrial Magnetism, Carnegie Institution of Washington. FLEMING, J. A. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 301–308, *Dec.*, 1942.

1256 550.34

Bibliography of seismology, July–December, 1942. HODGSON, E. A. *Publ. Dom. Obs., Ottawa*, 13, *pp.* 201–214, 1943.

1257 550.381(798)

Sitka Magnetic Observatory of the United States Coast and Geodetic Survey. GEBHARDT, R. E. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 319–323, *Dec.*, 1942.

1258 550.384 : 523.746

Solar and magnetic data, July to September, 1942, Mount Wilson Observatory. NICHOLSON, S. B., AND MULDERS, E. S. *Terr. Magn. Atmos. Elect.*, 47, *p.* 334, *Dec.*, 1942.

1259 550.384 : 551.8

A method of determination of the direction of the magnetic field of the earth in geological epochs. BENEDIKT, E. T. *Amer. J. Sci.*, 241, *pp.* 124–129, *Feb.*, 1943.—Sediments of ferromagnetic particles deposited in a magnetic field are magnetically anisotropic. A class of fine-grained sedimentary rocks (blue clay of the Boston Basin) exhibits anisotropy. This property can be used for the determination of the declination of the magnetic field of the earth at the epoch of the sedimentation of the specimen.

1260 550.384.3

Notes on the lunar geomagnetic tide. I. Its mathematical and graphical representations, and their significance. CHAPMAN, S. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 279–294, *Dec.*, 1942.—The author supplements and comments on a recent discussion of the lunar daily geomagnetic variation L [Abstr. 552 (1941)]. A means is proposed for representing L for any element and station, thoughout $\frac{1}{2}$ a lunation or any greater interval, by means of a surface or by plane contour lines repr. the surface. The relations betw. various aspects of L hitherto considered are elucidated with ref. to this surface. A. HU.

1261 550.385

Principal magnetic storms. July to September, 1942. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 336–340, *Dec.*, 1942.

1262 550.385(687)

An investigation of the disturbance daily variations of magnetic storms at Cape Town ($\phi = 33°.9$ S. $\lambda = 18°.5$ E. $\Phi = -32°.7$). GOTSMAN, B. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 315–318, *Dec.*, 1942.—[See Abstr. 2941 (1942)]. The disturbance daily variations of H, D and Z have been derived from 65 sudden-commencement storms distributed throughout the same period. The H-ranges of the storms chosen exceed 100 γ and the internat. character-number of each day was $> 1{\cdot}5$. The times of the commence-

ient of these storms were evenly distributed over the 4 hr.

1263 550.385(687)

Sudden-commencement magnetic storms in 1941. GG, A. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 329–331, ec., 1942.

See Abstr. 998 550.386 : 551.510.535 : 523.74 = 3

1264 550.389

American magnetic character-figure, C_A, three-hour-nge indices, K, and mean K-indices, K_A, for July to eptember, 1942. JOHNSTON, H. F. *Terr. Magn. tmos. Elect.*, 47, *pp.* 325–328, *Dec.*, 1942.

See Abstr. 1158 550.42 : 539.163 = 3

1265 551.311.12

Buried stagnant ice as a normal product of a pro-ressively retreating glacier in a hilly region. RICH, L. *Amer. J. Sci.*, 241, *pp.* 95–100, *Feb.*, 1943.—onditions at the margin of a continental glacier avour burial of ice under aggrading outwash gravels. n the retreat of a lobate glacier margin the lower limit f rapid down-melting is the top of the rising out-ash. Thin bodies of ice are buried in the valley ottoms and become stagnant as the moving ice shears cross them at the heads of the valley trains.

See Abstr. 1272 551.311.12 : 551.524.3

1266 551.465

Preliminary report on long-period variations in the ransport of the Gulf Stream system. ISELIN, C. O'D. *ap. Phys. Oceanogr. Met.*, 8, [40 *pp.*], *July*, 1940.—he results of temperature and salinity observations ade across the Gulf Stream betw. Montauk Pt. and ermuda on 15 voyages in the period 1937–40 are iven graphically. Transport fluctuations are com-uted by use of the circulation theorem and are ompared with tide-gauge records and thermograph ecords, with results which are in good agreement. A tentative mechanism is proposed in which the Gulf tream is part of a huge eddy with the Sargasso Sea s core, and the seasonal effect of winds is explored. A variation from 93 to 76 $\times$ 10^6 m.^{3}/sec. found during he period 1937–40 is likely to be matched by seasonal ariations in any year: the long-period variations ince 1922 are probably much smaller. A. HU.

1267 551.506.3 : 551.524.3(42)

Cold winters at Kew Observatory, 1783–1942. DRUMMOND, A. J. *Quart. J. Roy. Met. Soc.*, 69, *pp.* 17–32, *Jan.*, 1943.—The monthly means, derived rom the Syon House and Chiswick registers, were corrected to bring them into line with the corresp. monthly values obtained from the hourly measure-ments of the traces from the photographic thermo-graph in the North Wall screen at Kew Observatory. A series of mean monthly winter temperatures has been constructed.

See Abstr. 1282 551.510.42 : 551.591 : 551.594.13

See Abstr. 998 551.510.535 : 550.386 : 523.74 = 3

1268 551.510.535 : 621.396.11

Further notes on the electron density distribution of the upper ionosphere. RYDBECK, O. E. H. *Phil. Mag.*, 34, *pp.* 130–139, *Feb.*, 1943.—The F-layer electron density distribution is computed from the virtual-ht. data of the ordinary ray for several quiet days at Huancayo and Cambridge, Mass. The upper distribution is parabolic over a considerable range. Graphs show the daily and seasonable variations. The state of the F-layer cannot be completely described without specifying the total number of electrons below the max. density level, as well as the virtual ht. and max. density. A. HU.

1269 551.521.14 : 551.521.3

The reflection, absorption and transmission of solar radiation by fog and cloud. HEWSON, E. W. *Quart. J. Roy. Met. Soc.*, 69, *pp.* 47–62, *Jan.*, 1943.—Develops a system of equations for calculating the fractions of sun and sky radiation which will be resp. reflected, absorbed and transmitted at any level in a layer of fog or cloud. The droplet radius, the thickness of cloud and the amount of liquid per m.^{3} affect the values found. The ranges of these quantities are 2×10^{-3}–5×10^{-4} cm., 20–200 m. and 0·1–5 g./m.^{3}, respectively. The absorption is greatest in the upper layers of the cloud or fog. J. W. T. W.

See Abstr. 1269 551.521.3 : 551.521.14

1270 551.521.64

Committee on co-ordination of cosmic-ray investigations. FLEMING, J. A. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 309–314, *Dec.*, 1942.

1271 551.524.2(73)

Some recent temperature maps of the United States. VISHER, S. S. *Quart. J. Roy. Met. Soc.*, 69, *pp.* 67–72, *Jan.*, 1943.

1272 551.524.3 : 551.311.12

Glacier fluctuation. SELIGMAN, G. *Quart. J. Roy. Met. Soc.*, 69, *p.* 66, *Jan.*, 1943.—[See Abstr. 1699 (1942)].

See Abstr. 1267 551.524.3 : 551.506.3(42)

1273 551.524.36

Abnormally high and low daily mean temperatures, Kilmarnock, 1902–1941. DUNBAR, W. *Quart. J. Roy. Met. Soc.*, 69, *pp.* 63–65, *Jan.*, 1943.—[Abstr. 488 (1943)].

1274 551.525.2

Daily and seasonal changes in the surface temperature of fallow soil at Rothamsted. PENMAN, H. L. *Quart. J. Roy. Met. Soc.*, 69, *pp.* 1–16, *Jan.*, 1943.—A method of obtaining continuous records of soil surface temperature is described and 15 months' records are discussed. The relations betw. surface and sub-surface temperatures are considered and the inter-dependence of soil surface and air temperatures is examined. At all seasons the soil temperature is in phase with solar radiation whereas the max. air temperature is delayed; for air max. below 52°F. the daily range of soil surface temperature is approx. the same as that of the air temperature. Above this threshold the soil surface max. increases twice as rapidly as the air max. The effect of the diurnal oscillation of surface temperature on germinating seed is discussed.

See Abstr. 1276 551.575 : 551.591.1

1275 551.575.1

Association of large ions and fog. PHILLIPS, M. L. *Terr. Magn. Atmos. Elect.*, 47, *pp.* 295–299, *Dec.*, 1942—Washington data reg. the concentration of large ions are correlated with atmospheric visibility. Large ions are more numerous on a foggy day than on a clear day, and also on the day before the occurrence

of fog. Dense fogs are distinguished from light fogs mainly by higher humidity, and thence bigger particle sizes, rather than by more nuclei. A reciprocal relation exists betw. small ions and fogginess. The possibility that the relationship betw. large-ion concentration and fog is causal is discussed. A. HU.

See Abstr. 1282 551.591 : 551.510.42 : 551.594.13

1276 551.591.1 : 551.575

Seeing through fog. HOLMES, J. G. *Light and Ltg*, 36, *pp.* 23–26, 28 *and* 30, *Feb.*, 1943.—Discusses the factors which determine the range at which objects can be seen in a foggy or misty atmosphere by day. At night when an attempt is made to render an object visible by artificial light, the effects of absorption and scattering have to be considered separately. Formulae are quoted to determine the range of visibility of (*a*) a light in a night fog, (*b*) a light in a day fog, (*c*) an illuminated object in a night fog. J. W. T. W.

1277 551.593

Tentative identification of the Herzberg bands of O_2 in the ultra-violet spectrum of the night sky. SWINGS, P. *Astrophys. J.*, 97, *pp.* 72–74, *Jan.*, 1943.

1278 551.593 : 525.75 : 628.9

Observations of night-sky brightness and lume with special reference to coastal dimout requirements. BREEDING, H. A. *Illum. Engng, N.Y.*, 37, *pp.* 830–834, *Dec.*, 1942.—The author tabulates observed ranges of night sky luminosity at sea and on land, in the zenith and at the horizon, under diff. meteorological conditions. Sky lume observations made in the vicinity of 6 eastern U.S. cities under normal lighting conditions are compared with similar measurements made in dimouts, and the effects of population and distance of observer are shown. Data on ship visibility against sky and sea horizons with and without city lume in the background suggest that the visibility range of ships more than 15 ml. from shore will seldom be doubled as a result of sky glow. A. HU.

1279 551.593.55 : 535.247.2

Observations of the light of the night sky with a photo-electric photometer. ELVEY, C. T. *Astrophys. J.*, 97, *pp.* 65–71, *Jan.*, 1943.—Describes a photo-electric photometer designed to measure the infra-red radiation from the night sky and gives curves of the variation in intensity observed throughout typical nights. Nights may be divided into (1) those with a min. near midnight, and (2) those showing a decrease throughout the night. Irregular variations associated with magnetic activity are not uniform over the whole sky. J. W. T. W.

1280 551.593.55 : 551.594.52 : 535.247

The light of the night sky. ELVEY, C. T. *Rev. Mod. Phys.*, 14, *pp.* 140–150, *April–July*, 1942.—Summarizes the results of investigations carried out on the spectral distribution of the light which originates in the upper atmosphere, the non-polar aurora. The long-wavelength region to the far red is difficult to study and the interpretation of the results is uncertain. In the short-wave region, including the near ultra-violet, the information is more plentiful and the spectrum can be compared with that of the polar aurora. Th forbidden transitions of the O atom give the mo important radiations in the non-polar spectrun Variations of intensity with the season and wit magnetic conditions have been studied. A di cussion of Chapman's theory of the source of th energy needed [see Abstr. 2014 (1937)] is given in final section. J. W. T. W

1281 551.594.11

Further evidence of a latitude effect in potenti gradient. GISH, O. H. *Terr. Magn. Atmos. Elect* 47, *pp.* 323–324, *Dec.*, 1942.

1282 551.594.13 : 551.591 : 551.510.42

Effect of meteorological conditions on the electric conductivity of air at Colaba (Bombay). MUKHERJE S. M. *J. Univ. Bombay*, 11, *pp.* 45–55, *Nov.*, 1942.– Data of electrical conductivity of the air at Colab measured with a Gerdien apparatus during 1935–3 are correlated with meteorological conditions. Con ductivity is more dep. on wind direction during Nov. April than during May–Oct. This is due to th difference in nature and concentration of pollution Improvement of visibility goes hand in hand wit increase of conductivity. During rain, neg. con ductivity increases with intensity of rainfall but pos conductivity remains steady and below normal. Th diurnal and seasonal variations of conductivity an visibility in Bombay are found to be similar.

1283 551.594.25

The separation of electricity in clouds. CHALMERS J. A. *Phil. Mag.*, 34, *pp.* 63–67, *Jan.*, 1943.—Th theory of charge separation in clouds by frictio betw. ice particles of different sizes, though satis factory for thunderclouds, is difficult to apply t warm-front clouds. Extending Bergeron's theory o rain formation by the freezing of supercooled wate drops, the author suggests that a separation of charg will occur on sudden freezing much as it does on th breaking of a drop. A. HU

See Abstr. 1280 551.594.52 : 535.247 : 551.593.55

See Abstr 1259 551.8 : 550.384

VARIOUS SUBJECTS

See Abstr. 1165 576 : 612 : 539.163.4

See Abstr. 1117 591.85 : 537.311.35 : 621.317.332 = 3

See Abstr. 1165 612 : 576 : 539.163.4

See Abstr. 1231 621.34 : 541.18.03

See Abstr. 1067 667.2 : 535.379 = 3

See Abstr. 1181 669 : 539.26

See Abstr. 1200 669 : 541.124 = 3

See Abstr. 1175 669 : 621.385.833 : 539.211 ≙ 3

See Abstr. 1197 669.018 : 536.7 : 541.121 = 3

See Abstr. 1249 669.14 : 548.2 = 3

See Abstr. 1043 669.75 : 621.315.59 : 535.215

See Abstr. 1225 676 : 541.141

See Abstr. 1177 679.5 : 541.68 : 539.23

See Abstr. 1128 77 : 537.533.79

See Abstr. 1176 77 : 539.215.4